Rock Products
With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

Volume XXXIV Chicago, November 21, 1931 Number 24

Texas Sand and Gravel Producer Standardizes on Movable Plants

Texas Construction Material Co. Uses a Number of Small Movable Plants Instead of Large Permanent Units

THE SAND AND GRAVEL operations of the Texas Construction Material Co., extending over a considerable area in southeastern Texas, are interesting in that all of its screening and washing plants except one are of the movable type.

These operations, extending from Romayor, 70 mi. northeast of Houston, to Victoria, 130 mi. southwest of Houston, include eleven separate sand and gravel washing plants at seven different locations, as well as two additional plants for the production of a natural limestone road gravel. About three-fourths of the total production capacity is centered around Columbus and Eagle Lake, some 75 mi. west of Houston.

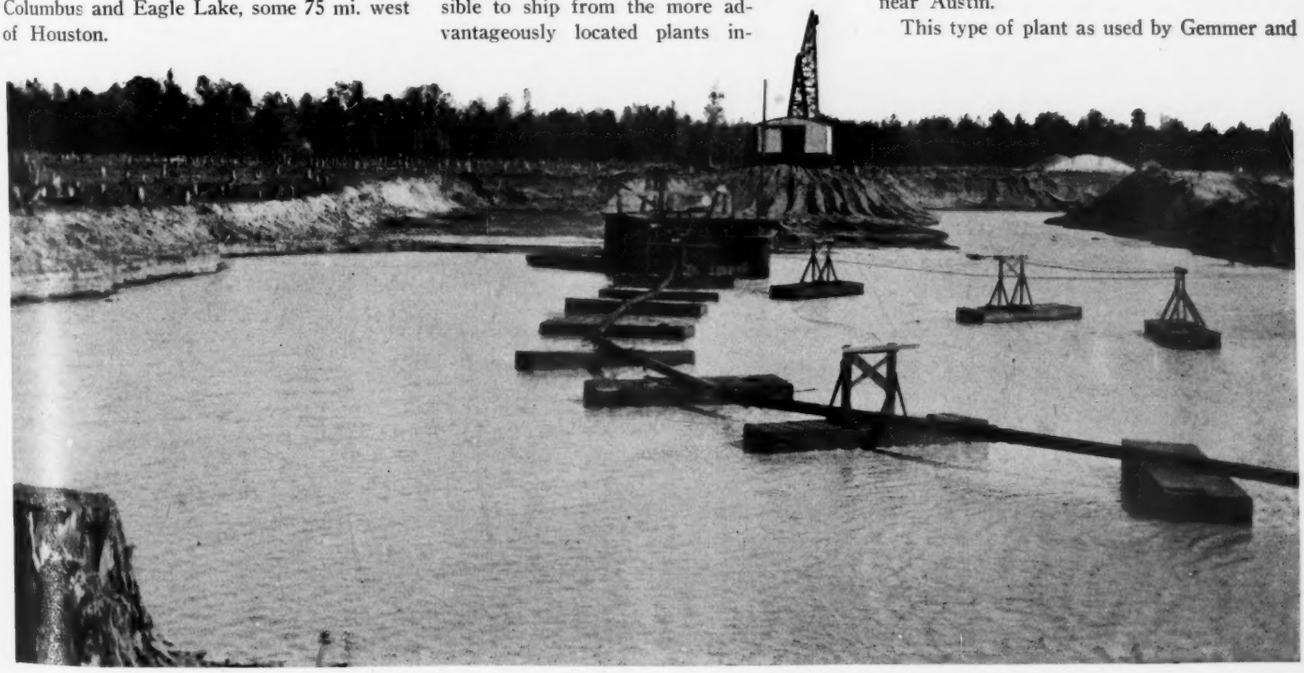
This company, which was formed in May, 1929, is a consolidation of the Gemmer and Tanner Co., Romayor Gravel Co. and Columbus Gravel Co. Later, in January, 1930, the Colorado County Gravel Co. was included. In December, 1930, the Victoria Sand and Gravel Co. and at about the same time a controlling interest in the Enos Sand and Gravel Co. were added. Also during the early part of 1930 a road gravel plant near Buda, Texas, was taken over.

The consolidation of these companies has resulted in a marked reduction in overhead, without any particular changes in the operating personnel, and has also made it possible to ship from the more advantageously located plants instead of cross shipping on longer hauls.

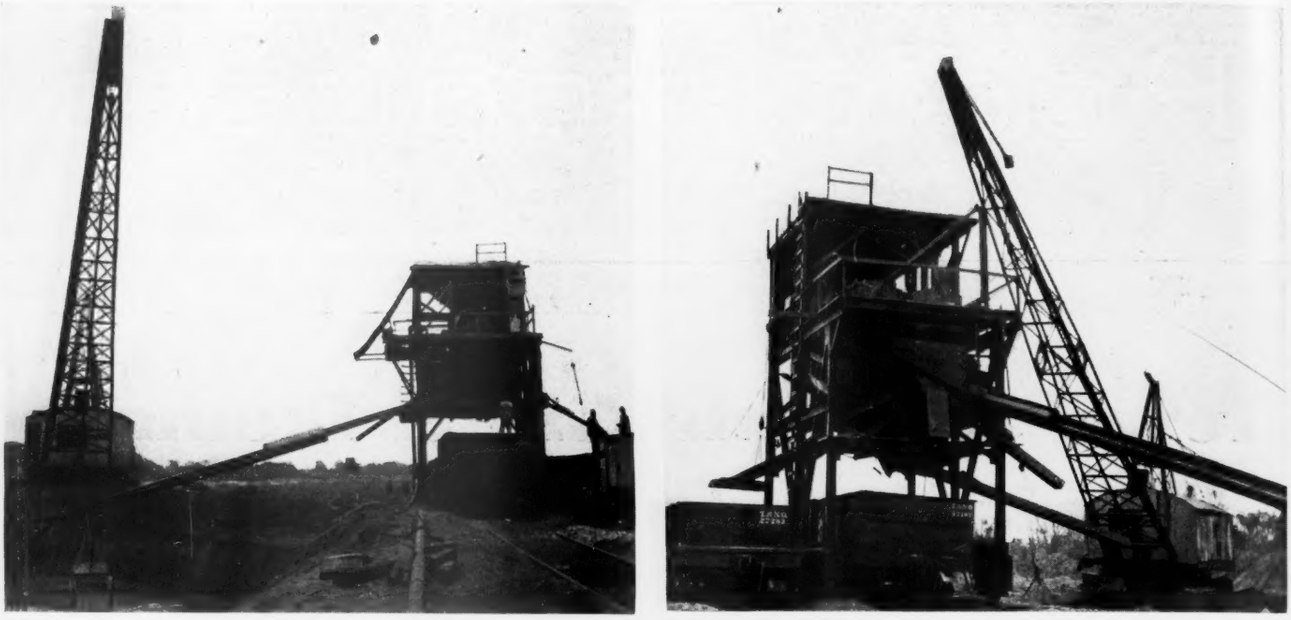
The ten movable screening and washing plants are as follows. Three plants at Columbus and one at Eagle Lake were formerly operated by the Gemmer and Tanner Co., two plants at Laban Spur, near Columbus, were formerly operated by the Columbus Gravel Co.; two plants at Romayor were formerly operated by the Romayor Gravel Co.; one plant at Burt Spur, near Columbus, was formerly operated by the Colorado County Gravel Co. The plant at Enos is operated as the Enos Sand and Gravel Co.

One of the road gravel plants is at Talton, near Columbus, while the other is at Buda, near Austin.

This type of plant as used by Gemmer and



Suction dredge with stripping dragline beyond, both electric motor driven, at Romayor plant



Two views of one of the plants at Columbus using vibrating screens

Tanner at Columbus, Texas, was described in an article in Rock Products, April 28, 1928.

General Description of Plants

The movable plants are all of the same general design and consist of one or two screens mounted on a steel framework which spans a railroad loading track. Some of the frames are mounted on wheels so that they are movable on a 15-ft. gage track. Others are moved by blocking them up with timbers on a railroad car and switching the car to the new location. Those served by draglines are moved about 30 to 40 ft. at a time to keep pace with the dragline and hence are mounted on wheels so that they may be easily moved. Those fed by dredges and pipe lines are moved less frequently and longer distances and are arranged with ordinary columns, except in the case of the larger plant at Eagle Lake which is also mounted on wheels.

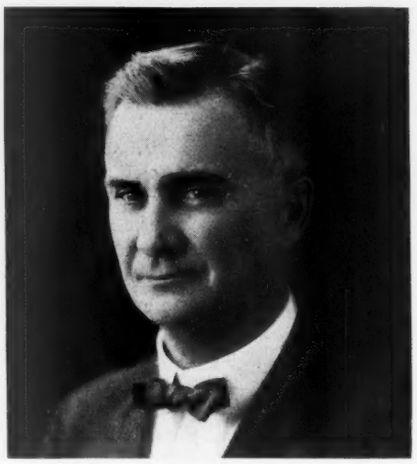
These plants have no bins, the material being loaded direct to railroad cars.

Dredging is done at four of the movable plants; namely, Eagle Lake, Enos, and the two plants at Romayor; also at Victoria, which, however, is a plant of an entirely different kind. The centrifugal pumps used in dredging are electric motor driven except at Victoria where steam power is used.

The draglines used at the other six plants which are located at Columbus, Laban Spur and Burt Spur, are driven by steam or Diesel power. Wherever steam is used the boilers are oil-fired.

Description of Materials and Operation

Except at the Victoria and Enos plants, where the material is dredged from the river, the sand and gravel is obtained from land deposits.



W. H. Gemmer, President

These deposits generally run toward fine material with some excess of sand so that little or no crushing is necessary and the excess sand and any oversize is run back into the pit. However, at one of the Laban Spur plants a portable crusher is used which is movable on a standard gage track. This is a McLanahan single roll crusher mounted on a flat car.

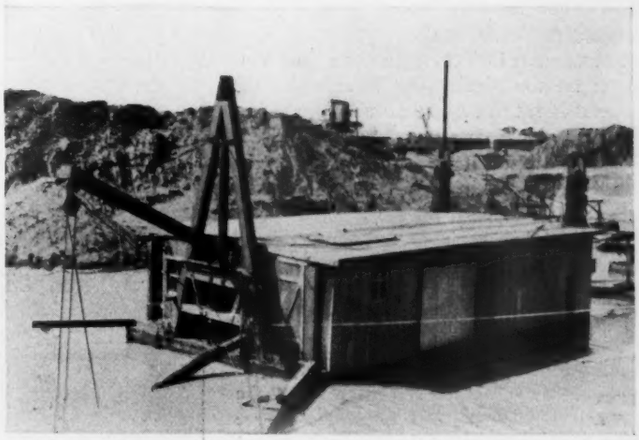
At the Buda plant, which will be described later, is an interesting installation of a McLanahan single roll crusher for crushing the limestone in the road gravel material. This material is a sort of "caliche" containing enough clay and limestone dust to cause it to harden as it dries, and is a difficult material to handle when wet. However, this machine which has been in use almost a year was said to have given very satisfactory results.

Revolving screens of the company's own design and construction are used at six of the movable washing plants, three plants having two such screens and three of them having a single screen. These are double jacketed and all alike and are unusual in that all screen sections are completely welded instead of being bolted or riveted. Any change in screen sections is generally made by lifting the whole revolving unit out with the dragline and substituting another.

Vibrating screens are used at four of the movable washing plants; two of the plants

General view of Victoria plant

One of the Romayor plants using vibrating screen



One of the 10-in. suction dredges at the Romayor plant

each have two Plato vibrating screens; one plant a single Plato screen, and another a single Niagara vibrating screen.

Dewatering screws below the screens are used at two plants for further washing of the gravel.

Each movable plant has a capacity of from 15 to 20 cars of sand and gravel per 10-hour day.

All Revolving Screens Are Interchangeable

In order to avoid repetition later it might be mentioned here that the revolving screens used at a number of the plants are of the same type and size so that the revolving units are interchangeable.

This screen consists of an inner barrel 14 ft. long and 36 in. in diameter of perforated metal with 2- to 3-in. holes, depending on the limiting size of the gravel to be produced. Around this inner barrel is a slightly shorter jacket of 54-in. diameter, with either 1- or ¾-in. holes, and around this is an outer jacket of 66-in. diameter with ¼-in. holes. Thus two sizes of gravel, sand and oversize are produced. Each section of the screen is welded to form a rigid cylinder and the three sections are all welded together with spacing bars between. All the screens are motor driven through gearing.

Gasoline engine driven crane for stockpiling at Romayor plant

Gemmer and Tanner Plants at Columbus, Texas

Three movable plants are used at this location. One of the plants has two Plato vibrating screens and the other two each have a single revolving screen. Each plant is supplied with material by a 3-yd. diesel engine driven dragline excavator of the company's own construction, which also backfills the stripping into the worked-out area.

Excavating is done to a depth of about

Two views of the Enos plant where two vibrating screens and log washers are used

30 ft. after removing about 4 or 5 ft. of stripping

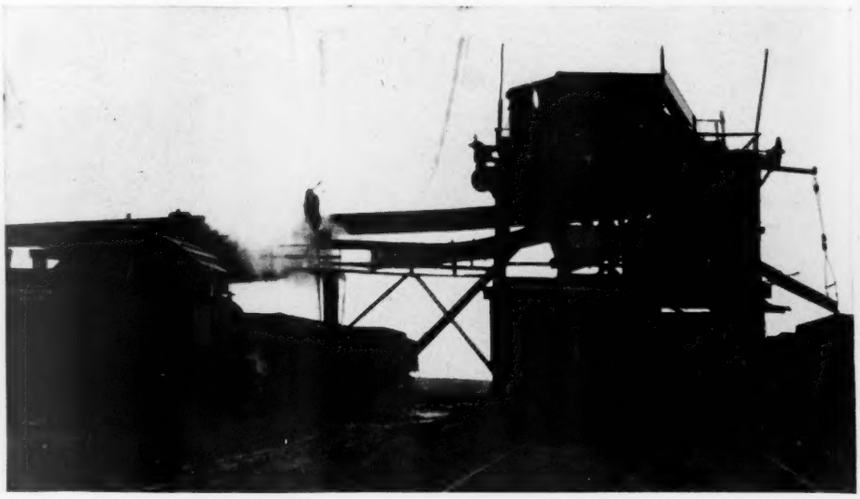
The dragline bucket empties to a feed hopper at the top of the plant from which the material is fed to the screens and the washed and sized material from the screens is loaded direct to railroad cars, gravel being loaded on the track alongside the plant and either gravel or sand on the track below.

The feed hopper is protected with grizzley bars to prevent any large boulders going through the plant. Excess sand and any oversize gravel, of which there is not a great deal, is run back into the pit. The plants are movable on a 15-ft. gage track.

The Plato vibrating screens used at the one plant are 4 ft. by 8 ft. in size with three decks having 2½-in., 1-in. (or ¾-in.) and ¼-in. openings and are arranged with jets for washing.

The water used for washing is drawn from a well several hundred feet from the plant and is furnished by a 6-in. Fairbanks-Morse centrifugal pump driven by a 40-hp. motor.

Oil-burning steam locomotives are used for switching the railway cars and two cranes are used for stockpiling.



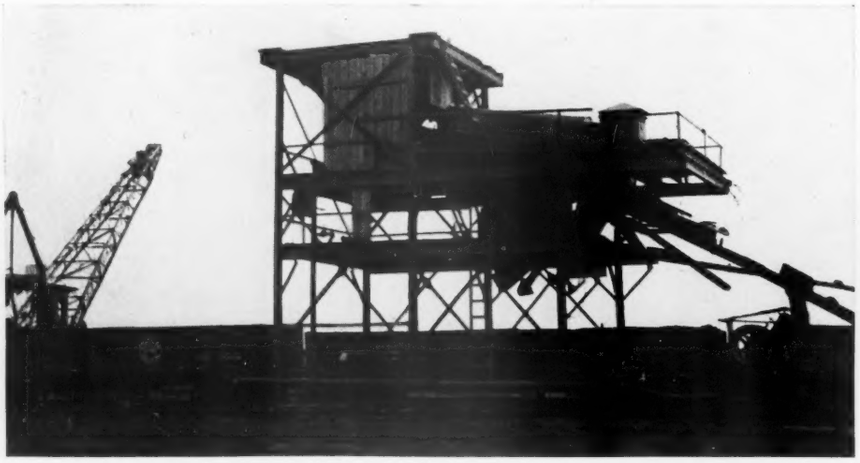
Eagle Lake plant with two revolving screens

Dredge and nature of deposit at Enos plant

Electric motor driven 10-in. suction dredge at Enos plant

These plants are about two miles south of the town and they are connected by a railroad spur with the Southern Pacific railway. Their combined capacity is about 50 cars per 10-hour day. S. G. Smalley is superintendent.

The plant at Burt Spur, near Columbus, which has a 3-yd. Monighan dragline and a single revolving screen unit, is operated along with the Columbus plants.



One of the plants at Laban Spur with two revolving screens and movable crusher

Eagle Lake Plant

The Eagle Lake plant, which was formerly operated by Gemmer and Tanner, consists of a single portable plant supplied by a suction dredge. A 15-in. Amsco pump driven by a 500-hp. Allis-Chalmers slip-ring motor delivers the material through a 15-in. pipe line to a steel hopper from which it flows to the screens.

This plant is larger than some of the others, extending over two loading tracks and with an additional loading track alongside

Two revolving screens of the type previously mentioned are used, the gravel falling from these to a 20-in. double-screw Perfect classifier where it is further washed and dewatered and from which it is then spouted to the car.

Part of the sand is settled and loaded below the screens and part is flumed to a settling hopper over an additional loading track, any excess being run back into the pit.

Another smaller dredge with a 6-in. pump

Equipment at the Enos plant includes a 20-ton gasoline locomotive and an electric motor driven crane for stockpiling

driven by a 75-hp. motor is used to reclaim this sand from the pit when any additional amount is required.

A dragline of the company's own construction with a 100-ft. boom and a 2½-yd. bucket and powered with a 150-hp. 440-v. Crocker-Wheeler motor is used to remove the stripping and backfill it into the worked-out area. A 1-yd. Northwest crawler type gasoline crane is used for stockpiling.

This plant has a capacity of about 40 cars per 10-hour day and has rail connection with the Atchison, Topeka and Santa Fe railroad. Harry Moreland is superintendent.

Laban Spur Plants

The two movable plants at Laban Spur, about 4 mi. from Columbus, were formerly operated by the Columbus Gravel Co.

One of these, which has replaced an older wooden plant, is the latest and most modern of these plants. It is of steel construction on wheels and contains two of the standard revolving screens, each driven by a 10-hp. General Electric motor through enclosed gear reductions. As already noted, it has a portable crusher, mounted on a flat car and belt driven by an individual motor and can be moved independently of the rest of the plant.

The second plant is of wooden construction and has two standard revolving screens. It is also mounted on wheels and is operated the same as the others.

Two No. 20 Bucyrus steam operated draglines with 90-ft. booms and 3½-yd. buckets are used to supply these plants with material and also to backfill the stripping. The boilers are oil-fired. Oil-fired locomotives are also used for switching.

These plants have a combined capacity of 30 to 40 cars per 10-hour day and have rail connection with the Southern Pacific railroad. I. Zatopek is superintendent.

Romayor Plants

The plants at Romayor, about 70 mi. northeast of Houston, were formerly operated by the Romayor Gravel Co., which was affiliated with the Beaumont Building Material Co.

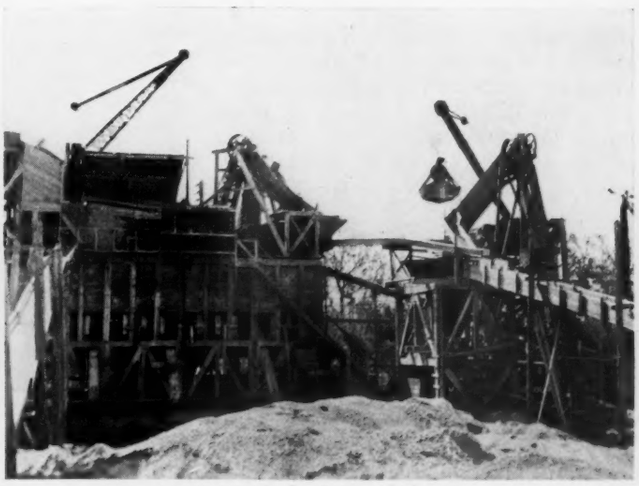
Here two movable plants of steel construction are used, each with a single vibrating screen. Each plant is supplied with material by a suction dredge which discharges through a pipe line to a box from which the material flows over the screen. Excess sand is sluiced back into the pit.

A 4-ft. by 8-ft. double deck Plato vibrating screen is used at one plant and a 4-ft. by 6-ft. double-deck Niagara screen at the other. These are arranged with jets for washing, water being supplied by a motor driven 6-in. centrifugal pump. Sand and gravel are loaded out on two tracks.

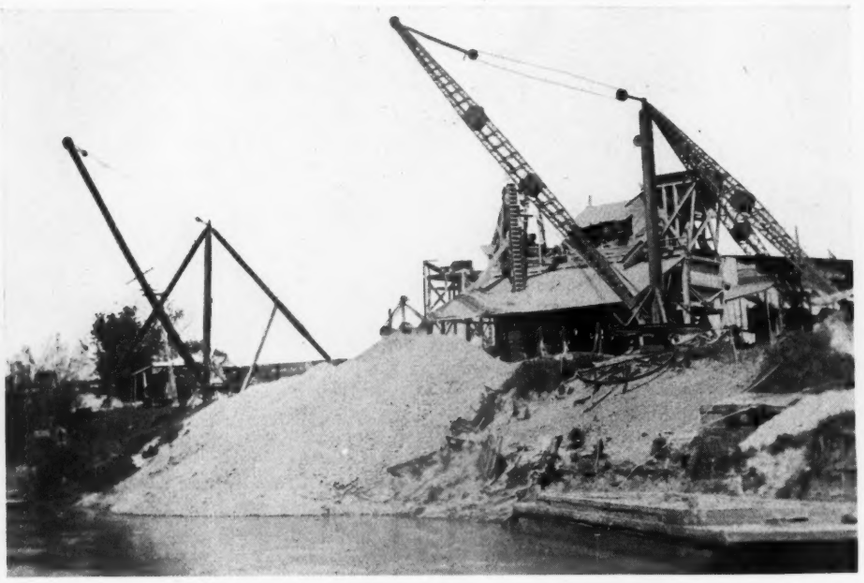
The dredges at these two plants are practically the same, each consisting of an 18-by 36-ft. hull with two spuds at the rear end, and having a 10-in. Amsco pump belt-driven by a 150-hp. 2300 volt General Electric induction motor. Each pump discharges through an 8-in. line and speed changes are made by changing pulleys. By using 10-in. pumps with 8-in. lines they are operated at somewhat slower speeds than would be necessary with 8-in. pumps, thus reducing the wear on the pump.

At one dredge a water jet is used alongside the suction pipe to break up the deposit whenever necessary. This is supplied at 100-

Dredge loading gravel to barge at the Victoria plant



Victoria plant, gravel handling at left, sand at right



River view of Victoria plant showing derricks used in unloading sand and gravel from barges

lb. pressure by a motor-driven centrifugal pump and is carried in a 3-in. line.

Transformers on each dredge provide power at 220 volts for lights and auxiliary motors.

The deposit is about 17 ft. deep and runs 35 to 40% gravel. Most of the production is 1½-in. Class A gravel, the greater part of which is shipped into Beaumont.

The stripping, averaging about 5 ft., is removed and backfilled by a dragline excavator of the company's own construction. This has a 3-yd. bucket and is driven by a 125-hp. General Electric motor.

A crawler type P and H gasoline combination crane and dragline with a 50-ft. boom and a 1-yd. bucket is used for stockpiling any surplus material.

Formerly the electric power used in operating the plant was produced by its own diesel engine generator plant but this is now kept as a standby and power purchased from the Gulf States Utilities Co. This comes in over a 7½-mile line at 13,200 volts and is transformed down to 2300 volts. Additional transformers are used at each plant to provide power at 220 volts for the small motors.

The two plants have a capacity of about 30 cars per 10-hour day and have rail connection with the Atchison, Topeka and Santa Fe railway. W. C. Torbett is superintendent.

Enos Sand and Gravel Co.

The plant at Enos, which is now included in the group and operated by the company, is about 40 mi. west of Houston on the Missouri, Kansas and Texas railway so that it is most advantageously located for shipments into Houston.

It is a double screen steel frame movable plant located on the bank of the Brazos river and the material is dredged from gravel bars in the river. The deposit runs about 35 to 40% gravel with not much oversize.

Dredging is done with a 10-in. Amsco pump direct-connected to a 250-hp. 505 r.p.m. Allis-Chalmers slip-ring motor operating on 3 phase 60 cycle 440 volt current. By means of a controller and resistance grids the speed may be regulated to suit the deposit.

A small motor-driven centrifugal pump is used for priming and for the water seal at the stuffing box, and a small two drum hoist belt driven by a 10-hp. Western Electric motor is used to raise and lower the suction pipe and to swing it horizontally. The equipment is mounted on a 20- by 40-ft. steel hull. The material is pumped through a 10-in. line to a feed box at the portable plant on the bank.

From the feed box at the top of the plant the material flows to a small revolving scalping screen where any oversize is removed and spouted over the bank.

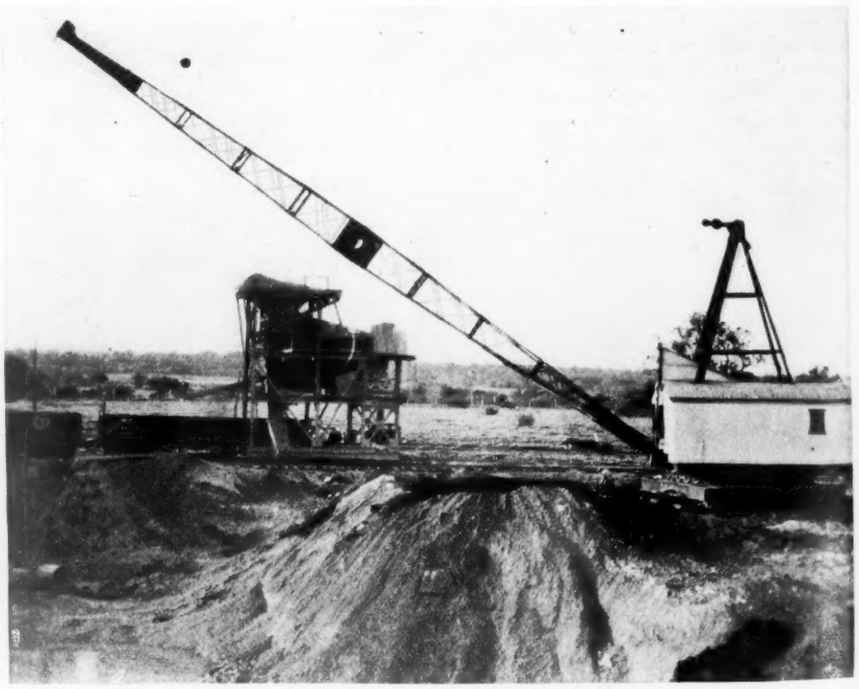
The sand and gravel passing through this scalping screen flows to two parallel 3-ft. by 8-ft. double-deck Plato vibrating screens with ¾-in. and ¼-in. mesh wire cloth. Normally, unless it is desired to make two sizes, all the gravel passing over both decks of these screens falls to a double-screw Eagle log washer where it is further washed and from which it is discharged to a railroad car on the track alongside the plant.

The sand passing through the lower decks of the screens is hoppered to a single screw dewatering box of the company's own make from which it falls to a car on the track below. Water jets are used in this box and are regulated to wash out as much fine sand as desired. Excess sand is flumed back down the river bank.

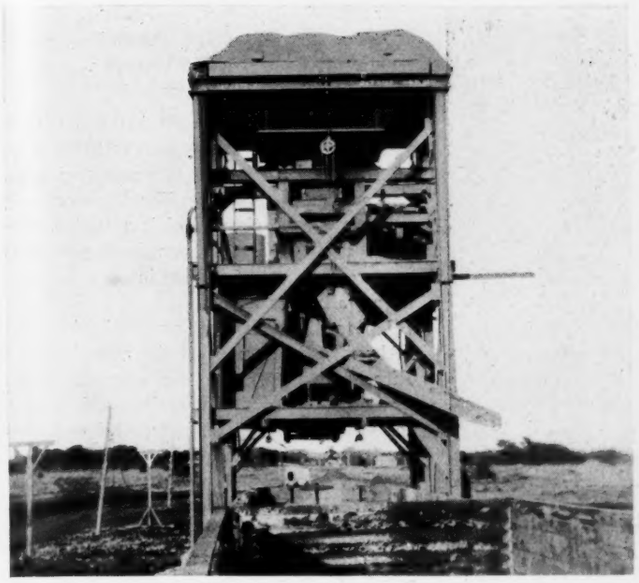
The water used in washing is drawn from the river and supplied to the plant by a 6-in. centrifugal pump driven by a 30-hp. motor.

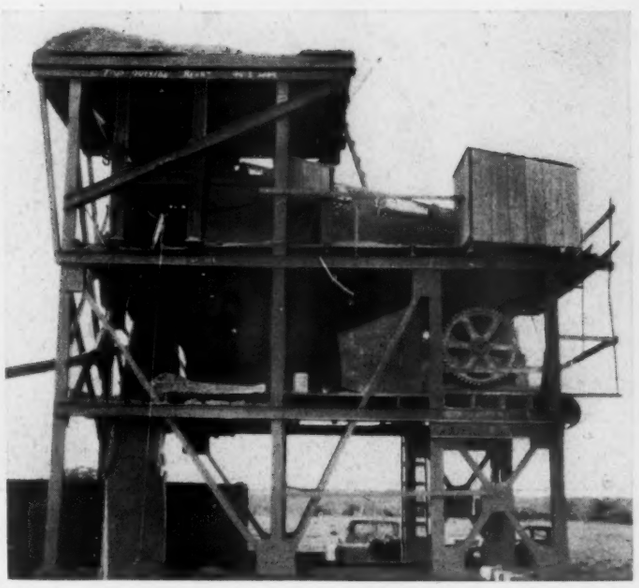
Surplus material is stockpiled from cars by a Link-Belt crawler type crane which is equipped with a 1-yd. Blaw-Knox Dreadnaught clamshell bucket and is driven by a 60-hp. General Electric squirrel cage motor.

A 20-ton Plymouth gasoline locomotive is used for switching cars and has been handling that part of the job satisfactorily. It was stated that it has moved as many as twenty-one loaded cars at a time, which is something when it is considered that most of these are the Katy's 140,000-lb. capacity gondolas.



General view of Buda plant and deposit, showing motor-driven dragline





Two views of Buda plant, where a natural limestone gravel is prepared, using a revolving screen and single roll crusher

The plant has a capacity of 20 to 30 cars per 10-hour day. Raymond Witte is superintendent.

Victoria Plant

At the Victoria plant the operation is of an entirely different nature. Here the material is dredged from the Guadalupe river to barges, which are then towed to the washing and sizing plant.

By the use of gravity screens on the dredges the pump discharge is separated as to sand and gravel, the gravel being spouted to a barge at one side of the dredge and the sand returned to the river or to a barge on the other side.

This deposit runs for the most part about 70 to 75% well graded gravel, of which about 25 to 30% is larger than 2½-in. and has to be crushed. Heavier sand deposits also occur at certain points where the river has been widened out and these are worked in the same way for sand instead of gravel. Thus the barges are loaded with either gravel or sand.

Considerable gravel has been taken out during the past 15 years so that the river has been widened in places. However, at other points it remains comparatively narrow and swift making it a little troublesome at times to handle the dredges and barges.

Three dredges are used, one with a 10-in. Amsco pump, one with a 10-in. Morris pump and one with an 8-in. Morris pump. These are all belt driven by steam engines and the boilers are oil-fired.

A 40-ft. suction pipe is used with a swing joint at one corner of the hull and dredging can be done to a depth of 30 ft. The suction pipe is raised and lowered by a drum hoist and cable and is moved laterally by moving the dredge, this being controlled by a drum hoist and land lines running to both banks.

Eight barges of 40-yd. capacity are used and these are moved by three tow boats equipped with 40-hp. Wolverine gasoline engines.

The screening and washing plant is built on the river bank and the barges are unloaded by two stiff leg derricks with clamshell buckets.

The gravel is handled by an American Hoist and Derrick Co. steam-operated steel derrick with a 90-ft. boom and a 2-yd. Hayward bucket which unloads to a pile on the bank as indicated in one of the illustrations. It is then picked up from the lower edge of this pile at the water's edge and put into the hopper at the top of the plant. In this way the material is given some additional washing at this point and the stream has a chance to carry away any sticks or trash.

From the hopper at the top of the plant the gravel is fed to a 60-in. by 18-ft. single jacketed Allis-Chalmers revolving screen, arranged with jets for washing, where sizes from 3-in. down to ¼-in. are separated out and spouted to the bins below.

Any oversize gravel goes to a bin and is crushed at intervals as necessary by two No. 4 Allis-Chalmers gyratory crushers. The crushed material is then carried up in a bucket elevator to a 40-in. by 12-ft. Allis-Chalmers revolving screen where it is sized and falls to loading bins of timber construction below.

The sand is unloaded from the barges by a second American Hoist derrick with an 80-ft. boom and a 1½-yd. bucket to a similar storage pile or direct to a hopper from which it is flumed to a large Allen sand cone and loaded direct to cars on a second track.

Coarse sand from the graved washing operation as well as excess sand passing over the Allen cone are flumed to piles alongside the plant from which they may be mixed and reclaimed as desired by means of a small belt bucket elevator delivering to the flume above the cone.

A small Shay geared locomotive and also a steam hoist with wire rope cable are used for switching cars.

A small Monighan dragline excavator with a 50-ft. boom has been equipped with a ¾-yd. clamshell bucket for use in stockpiling. This was formerly gasoline engine driven and has been electrified by installing a 75-hp. General Electric motor with Dayton cog belt drive.

In order to permit night operation of the dredges and barges flood lights with 500 and 1000 watt lamps and reflectors were installed to light up the river between the dredge and the plant.

The company also has under consideration the installation of a portable plant similar to those used at the other operations. This would be located opposite the dredge and the material pumped direct to it for loading to cars thus cutting out the handling on barges and by derrick.

This plant has a capacity of 35 to 40 cars per day and has rail connection with the Missouri Pacific railway.

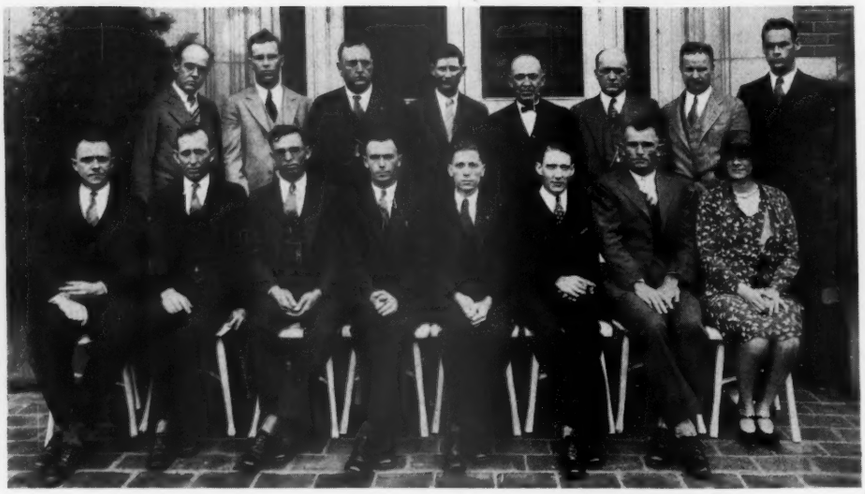
W. B. Du Pré, who has been operating the plant for many years, is in charge.

Buda Plant

The plant at Buda, which is about 15 mi. south of Austin, produces road gravel only and has a number of interesting features. It is a steel frame movable plant on wheels and similar to the others in that respect.

Here there is a deposit of limestone gravel containing about 20% of limestone dust and clay which acts as a natural binder and hardens up as it dries.

A dragline excavator of the company's own make with a 2½-yd. bucket and driven by a 150-hp. motor is used to excavate the material and deliver it to the plant hopper.



Group of department heads of Texas Construction Materials Co.

Top row, left to right—W. E. Sampson, vice-president and general manager; R. C. Armstrong, salesman; T. J. Beesley, production engineer; Harry Moreland, superintendent, Eagle Lake plant; A. L. McCormick, office manager, Gemmer and Tanner plant; L. S. Lawrence, assistant production engineer; J. G. McGregor, cashier and manager, accounting department; D. W. Arrington, office manager, Eagle Lake plant.

Bottom row, left to right—H. F. Miller, purchasing agent; S. G. Smalley, superintendent, Gemmer and Tanner, and Burt Spur plants; W. C. Torbett, superintendent, Romayor plant; C. M. Gandy, office manager, Romayor plant; T. D. McCandless, cost accountant; R. L. McMillian, civil engineer; I. Zatopek, superintendent, Columbus Gravel Co. plants; Miss Margaret Everett, office manager, Columbus Gravel Co. plants.

Because of the sticky nature of this material as it comes from the pit, it will not flow in a hopper or spout and hence a small apron conveyor type feeder 24-in. wide and about 4-ft. long is used below the hopper to feed it to the screen. The hopper is covered with a grating of heavy steel bars on edge (about 1¾-in. by 6-in.) to prevent any large boulders going through the plant.

A single-jacketed revolving screen with 2½- and 3-in. holes in the inner barrel and 1½-in. openings in the jacket is used to scalp out the oversize, this falling to an 18- by 36-in. McLanahan single-roll crusher. The material which has passed through the crusher as well as the fines from the screen are collected on a short belt conveyor extending back under the screen, and this in turn discharges to the railroad car below. In this way the material passing through the screen and that which has been crushed are re-combined and kept properly mixed.

Although a difficult material to handle and crush, the single-roll crusher has proven most satisfactory in handling it. A jaw crusher was previously used but would not let the material pass through it readily.

Each unit is driven by a separate motor through gearing, and a motor-driven drum hoist and cable is used to move the cars during loading.

The capacity of the plant is about 25 cars per day. W. P. Johnson is superintendent.

General

Summed up, there are eleven washing plants and two road gravel plants in connection with eight dredges, some eighteen draglines and cranes and thirteen locomotives.

In maintaining this equipment all ordinary repairs and changes are taken care of by a small shop at each plant, but large or heavy work is handled at a main shop at the Columbus plant.

Each plant shop has the usual equipment of small power-driven tools, while the main shop is equipped to turn out almost any kind of work, including boiler and locomotive work and the repairing or building of practically any of the equipment used.

In fact, the company has gone further than many others in the matter of repairing and building its own equipment, having built complete a number of the dragline excavators used. The revolving screens already mentioned were also built in this shop, using railroad rails as the longitudinal members of the revolving unit and steel end castings, the whole being thoroughly electric welded.

Both oxy-acetylene and electric welding equipment are used at practically all the plants, and in addition a gasoline engine-driven electric welding outfit is mounted on a truck for use at any location.

An interesting detail which might profitably be followed by many other plants is the fact that the company has largely discontinued the use of cast iron and uses steel castings instead, thus materially reducing repair costs and interruptions.

A warehouse stock is maintained at Columbus and a large stock of patterns for all replaceable parts has accumulated over a period of years. Such items as wire cable, oils, rails, structural steel, etc., are purchased in carload lots.

The general offices of the company are in the Petroleum Building, Houston, Texas. W. H. Gemmer is president; W. E. Sampson, vice-president and general manager; E. P. Gemmer, secretary-treasurer and sales manager; T. J. Beesley, production engineer; L. S. Lawrence, assistant production engineer; H. F. Miller, purchasing agent; and J. M. Corley, traffic manager.

Cement Markets of Costa Rica

THERE is no cement plant in Costa Rica. The country is said to possess an abundance of raw materials like limestone and gypsum, but no cheap fuel is available. The possibilities of cement manufacture in Guanacaste province have been investigated with negative results.

Up to 1928 the German portland cement "Alsen" had the bulk of the sales in Costa Rica, but since that year other European firms have entered the market, and in 1930, so far as statistics are now available, Norwegian cements formed about 75% of total imports. American cement has never taken the lead in this market; there is no prejudice against the American product, but the price has been too high for the local demand. Certain American cements are employed in Costa Rica for special purposes, as when quick-hardening cement is required, or white cement for surfacing buildings.

At present there appears to be no agent for American cement in San Jose; indications are that imports from the United States are practically all for use at Port Limon or its vicinity. Two prominent Costa Rican firms have stated that they would be interested in obtaining agencies for the American product if it is put into a position to compete with the European cements, reported here to be a possibility in the near future.

A local firm handles nearly all of the cement imported at San Jose, taking advantage of the great reductions in Puntarenas-San Jose rail freight on large shipments. It is said to be practically without capital at present, and to receive shipments from the Norwegian manufacturers on a consignment basis. Entire shiploads of about 20,000 bbl. each arrive at Puntarenas every month or two.

Costa Rica is going through a period of inactivity in building after a mild period of prosperity in 1929. The street paving program calling for large quantities of cement is finished. No large public or private cement-consuming undertakings are in sight. On the other hand, use of reinforced concrete is being more favored for ordinary construction on account of its resistance to fire and earthquake. It seems probable that imports will go back to the 1928 level, and thence gradually rise in succeeding years.

The difference in price between American and European cements is at present too great to be overcome by reductions in freight and handling charges, but if there are further reductions in American prices the market might come within reach.

The above, and information on duty, containers, freight charges, important statistics, etc., are contained in special circular No. 8 of the Minerals division of the Bureau of Foreign and Domestic Commerce.

Economics of the Nonmetallic Mineral Industries*

Part X—Traffic Departments and Freight Rates

By Raymond B. Ladoo

Manager of the Industrial Commodities Department, United States Gypsum Co.

Abstract

***ESTABLISHMENT** and use of proper freight rates, checking freight bills and routing are vital to most of the rock products industries.*

Check must be made on local freight clerks' or station agents' classifications or rates.

Rates to new locations must frequently be established.

Competitors' rates and rate changes must be watched.

All rate changes and prospective changes must be considered in respect to future operations.—The Editors.

A BETTER UNDERSTANDING of the importance of the functions of a traffic department has been evident in the nonmetallic mineral industries in recent years. Studies of traffic problems have been fostered by trade associations, chambers of commerce and trade journals, such as ROCK PRODUCTS. Most of the larger producers and many of the smaller ones have traffic managers and traffic departments. Even the smallest producers may obtain the benefits of expert advice on traffic, through consulting traffic men and traffic bureaus.

The importance of "place value" of minerals has been discussed before and transportation factors will receive attention later. While the establishment and use of proper freight rates, checking of freight bills, routings and so on are important in all industries they are vital in many of the nonmetallic mineral industries. On such low priced bulk commodities as crushed stone, sand and gravel, agricultural limestone and gypsum, crude feldspar, portland cement, gypsum plaster, lime and so on, the freight rate is often more than the price per ton f.o.b. producing point. Price competition is keen and a difference in freight rate of a few cents per hundred pounds, often means the gain or loss of an order or between profit and no profit on an order gained.

A Good Traffic Department a Good Investment

A good traffic department will pay for itself many times over. Our freight rate structure is exceedingly complicated and illogical. Individual rates have been published to meet immediate needs without much regard for cost of service, length of haul, or type of commodity. They have been based on charging "what the traffic will bear." Once they are firmly established and industries built up around them, they are exceedingly difficult to dislodge and they serve as precedents for the establishment of other illogical rates. Many commodities may be shipped under several different classifications carrying different rates. Unless carefully checked by shippers a railroad freight rate clerk, particularly in small, out-of-the-way stations, will often apply either the first rate or the highest rate he finds. Well informed companies know what the rates should be and demand and get them. If they have been overcharged they find it out when they check their freight bills and obtain refunds for the overcharges from the railroads.

A good traffic department studies not only its own but also competitive freight rates. A competitor may be using an improper rate which is too low and getting desirable business on that basis. This use of improper freight rates is sometimes done with the knowledge of the railroads, but more often slips by through carelessness or ignorance of proper rates on the part of some railroad clerk. Relief from such a condition may be easily and quickly obtained through the proper channels.

Establishment of Freight Rates

It is not always easy to get favorable freight rates established. A good traffic department, which studies the situation, collects and prepares evidence and arguments and presents the best possible case, has the best chance to get the rates desired.

There is a strong and growing tendency on the part of the railroads and the Interstate Commerce Commission to revise freight rates and place them on a mileage basis, particularly in the group of heavy, low-priced commodities shipped in bulk. This, of course, is a logical tendency and, in general, one much desired by the railroads. But it is often strongly and quite reasonably resisted by producers whose rates would be increased by the change.

As noted before, many industries and methods of distribution have been founded and grown prosperous under existing freight rate structures. To change them radically often works great injustice and hardship. It is the duty of a traffic department to watch such tendencies, anticipate them and provide for them, where possible, and to present the best possible case for the retainment of old rates or for publication of least harmful changes.

All important producers of bulk mineral products today need some effective form of traffic service, either by having their own traffic department or by the use of some group traffic agency.

(To be continued)

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September Asbestos Production in Canada

THE Dominion Bureau of Statistics reports that shipments of Canadian asbestos in September advanced 20.7% to a total of 15,786 tons as compared with the August production of 13,079 tons. In September, 1930, shipments amounted to 20,629 tons.

Exports of asbestos from Canada were recorded at 14,110 tons in September and consisted of 11,726 tons to the United States, 956 tons to Belgium, 673 tons to Germany, 379 tons to Japan, 172 tons to the Netherlands, and lesser tonnages to France, Italy, Porto Rico and Great Britain. Canadian manufacturers exported finished products to a value of $7,232; the British market absorbed 80.8% of these exports. Imports into Canada of various manufactured articles of asbestos were valued at $40,307; the United States supplied 71.1% of these importations, Great Britain, 20.5%; Austria, 5.0%, and Germany, 3.4%.

The Canadian asbestos mining industry maintained the encouraging advance in employment shown in August.

The Place of Pumice and Pumicite in Industry

By J. T. Palmer and L. M. Grigg
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WE ARE ACCUSTOMED to thinking of volcanoes as monsters of destruction, but they have given us one of our most important nonmetallic minerals—pumice and volcanic ash or pumicite. Pumicite is a product of explosive action within volcanoes, which sends forth these finely divided, sharp, angular grains of glass. These innumerable particles drift through the air and finally settle to the earth, forming deposits of pumicite.

Generally, the coarser grained deposits are found near their source, while the finer grained deposits are found far from their source. The thickness of pumicite deposits does not bear any relation to the distance from their volcanic source. The source of the pumicite beds of Nebraska and Kansas was the volcanic region of Colorado, Arizona and New Mexico. While most of the beds are plainly wind-laid, some have been transported and laid-down by water.

Pumice, solidified lava, being heavier than air, falls near its source after losing the momentum set-up by the volcanic eruption. Obviously, deposits of pumice are not found remote from their sources.

Physical Properties

Pumicite is a finely divided powder, composed of highly angular glassy grains of silicious material which under the microscope resembles broken glass. The material is unconsolidated, but may be slightly coherent. The grains vary in size from coarse to fine, and are more or less brittle. Pumicite settles readily in water, its specific gravity being 2.5. It has no cleavage, and has an irregular fracture. The color of pumicite varies from white to blue. However, impurities, especially iron oxides frequently give the deposits red and yellow colors.

Pumice, which is found near volcanoes in solid blocks, is a highly vesicular glassy lava, fine grained, highly coherent and varying from strong and solid to slightly friable. It has a specific gravity of less than 1, and floats until water-logged. Pumice is usually white in color, but shades into light-gray.

Chemical Composition and Analysis

Pumicite and pumice consist of the following constituents in combination: silica (SiO_2), alumina (Al_2O_3), iron oxides (Fe_2O_3, FeO), magnesia (MgO), lime (CaO), soda (Na_2O), potash (K_2O), water, titanium oxide and organic matter.

Editors' Note

THIS article should be of interest, as it gives in concise form information regarding the nature of pumice and pumicite, where it occurs, its various uses, and statistics on production and consumption.

Tables are included, giving the production of pumice and pumicite in the United States, and the imports, chiefly from Sicily.

—The Editors.

TABLE II—PER CENT. RANGE OF CONSTITUENTS IN PUMICE GIVEN IN TABLE I

Constituent	Low %	High %	Variation	Typical analysis
SiO_2	61.07	76.91	15.84	70.59
Al_2O_3	12.18	17.55	5.37	14.25
Fe_2O_3	0.48	2.46	1.98	1.55
FeO	0.92	4.13	3.21	2.34
MgO	0.00	2.26	2.26	0.92
CaO	0.54	6.28	5.74	2.00
Na_2O	3.50	4.74	1.24	4.05
K_2O	0.73	4.80	4.07	2.76
H_2O	0.90	2.06	1.16	1.35
TiO_2	0.18	0.47	0.29	3.25

Table I gives the analyses of pumice and pumicite. Columns 1, 2, 3, 8 and 9 are for pumice, and 4, 5, 6, 7, 10 and 11 are for pumicite. Table II gives the range of the per cent. of the different constituents in pumice, analyses of which are given in Table I, and also a typical analysis. Table III gives the range of the per cent. of the different constituents in pumicite (Table I) and a typical analysis.

TABLE III—PER CENT. RANGE OF CONSTITUENTS IN PUMICITE GIVEN IN TABLE I

Constituent	Low %	High %	Variation	Typical analysis
SiO_2	68.68	73.44	4.76	70.63
Al_2O_3	12.69	15.48	2.79	14.14
Fe_2O_3	0.08	1.14	1.06	1.25
FeO	0.19	1.17	0.97	0.68
MgO	0.24	1.14	0.90	0.61
CaO	0.86	3.23	2.37	1.44
Na_2O	1.32	1.69	0.37	3.41
K_2O	5.88	6.64	0.76	6.26
H_2O	4.08	7.99	3.91	4.07
TiO_2	.....	.....	.....	.....
Miscellaneous	0.40	2.13	1.73	2.13
Organic matter	4.05	8.22	4.17	5.74

Distribution

Commercial deposits of pumice and pumicite are found widely distributed in all parts of the world. However, the most important and extensive deposit of high-quality pumice in block form is located on the northern coast of Sicily, about 40 miles from the mainland of Italy. In the United States good grades of lump pumice have been exploited in the regions of Mount Shasta and

TABLE I. ANALYSES OF ELEVEN SAMPLES OF PUMICE AND PUMICITE†

	1	2	3	4	5	6	7	8	9	10	11
SiO_2	67.39	76.91	61.07	71.80	73.44	68.82	68.68	73.91	73.70	69.12	71.92
Al_2O_3	15.99	12.18	17.55	15.48	13.68	13.31	12.69	13.30	12.27	17.64	12.74
Fe_2O_3	0.56	0.48	2.13	0.80	0.98		1.14	2.46	2.13		2.08
FeO	1.99	0.92	4.13	.....	.....	0.19	1.17	.....	.....	.....	.....
MgO	0.77	0	2.26	0.53	0.57	0.96	1.14	0.37	0.29	0.24	0.21
CaO	1.63	0.92	6.28	1.42	1.24	3.23	1.11	0.54	0.65	0.86	0.82
Na_2O	4.74	4.17	3.50	5.89	5.91	3.57	1.32	3.63	4.25	1.69	7.22
K_2O	4.80	3.15	0.98				5.88	4.18	0.73	6.64	.....
H_2O	2.06	0.90	1.60	4.08	4.18	.....	7.99	1.01	1.22	.....	0.06
TiO_2	.....	0.18	0.47	.....	.....	.....	.....	.....	.....	.....	.....
Miscellaneous	.....	.....	0.40	.....	.....	2.13*	.....	.....	.....	.....	.....
Organic matter	.....	.....	.....	.....	.....	8.22	.....	.....	.....	4.05	4.95
Total	99.63	99.81	100.37	100.00	100.00	100.44	100.73	99.40	99.82	100.24	100.00

†R. B. Ladoo, Nonmetallic Minerals, p. 456.
*SO_3.

1—Pumice, Mono Lake, Calif.—Melville, analyst. See Bull. 150, p. 148, U.S.G.S.
2—Pumice, Katman Volcano, Alaska, 1912 eruption—G. Steiger, analyst, U.S.G.S.
3—Pumice, Mt. Pelee, May, 1902, eruption—See Diller, Nat. Geog. Mag., V. 13, p. 285.
4—Pumicite, Orleans, Harlan County, Neb.—Analysis by Univ. of Neb., V. 4, part 27, p. 398, Neb. Geol. Survey.
5—Pumicite, Custer County, Neb.—Analysis same as 4.
6—Pumicite from 7 miles south of Okemah, Okla.—Aurin, analyst, Okla. Geol. Survey.
7—Pumicite from Gallatin County, Mont.—Rowe, Jesse Perry, Bull. 17, pp. 9-10, Univ. of Montana, 1903.
8—Pumice, Mt. Shasta, Siskiyou County, Calif.—Analysis by Commercial Electrolytic Corp. for Brand and Stevens.
9—Pumice Lipari, Sicily—Authority, Mitchell. Quoted in Tariff Brief by Brand and Stevens before Committee on Ways and Means, House of Rep., January 10, 1921.
10—Pumicite, Harlan County, Neb. From Merrill's Rocks, Rock-weathering and Soils, p. 350, 1904. Same as 4.
11—Kansas City Testing Laboratory Report No. 111, 248, February 17, 1928.

the Salton sea in California, and in Coconino county, Arizona, but in general these deposits are so inaccessible as to render them non-competitive against imports of Italian pumice.

Abundant deposits of pumicite are being worked in California, Kansas, Nebraska, Arizona and Oregon. Other states known to contain pumicite deposits are Colorado, Montana, New Mexico, Wyoming, Utah, Idaho and South Dakota. Fig. I shows the location of the principal deposits of pumice and pumicite in the United States.

Fig. 1. Principal pumicite deposits in the United States

In Nebraska and Kansas, where at present most of the commercial output of pumicite is mined, the beds vary in thickness from a few feet to 10 or 25 ft., and most of the deposits now being worked are 8 to 10 ft. thick. Generally, the pumicite beds are covered with an overburden of soil, loess and gravel, but the average thickness of the producing areas is not more than 6 to 12 ft.

Mining and Milling

The mining of pumicite is a very simple operation. The overburden is removed by means of plows and scrapers pulled by teams and dumped on waste land, exposing acres of white pumicite. In the smaller mines a protective covering of soil 1 to 2 ft. thick is left until the product is ready to be removed. There is a growing tendency toward removing the overburden by mechanical means. Underground mining is impracticable because of the high cost of operation and the low market price of the product.

Following the stripping process, the crude pumicite is shoveled directly into wagons from the floor of the mine, or is scraped over loading dumps and caught in wagons below, and hauled to a mill where it is prepared for shipment.

At the mill the raw material is calcined and screened to remove impurities, graded according to the size of the particles and either bagged for shipment or loaded in paper-lined box cars.

As the many industrial uses of pumicite depend on the size of the particles, they are very carefully screened and graded. The following is a screen analysis of a commercially worked deposit showing the percentages of ash passing the various meshes.

SCREEN ANALYSIS OF PUMICITE

Passing 200-mesh	90.5%
Retained on 100-mesh	4.7%
Retained on 80-mesh	1.9%
Retained on 40-mesh	0.7%

Commercial pumicite is graded as coarse (F), medium (FF), fine (FFF) and sometimes as very fine (FFFF). Imported Sicilian pumice comes in grades F, FF and FFF.

Uses

The two chief uses for pumice and pumicite in industry are* (1) as an abrasive, and (2) as a light-weight aggregate. As an abrasive pure lumps of pumice are used for polishing various metals such as copper and silver before plating; for rubbing down wood and metal surfaces, such as furniture, pianos, phonographs and automobile bodies for painting and varnishing; for polishing cutlery, surgical instruments and fine tools; for cleaning and polishing stone and glass. Finely ground pumice is used in toilet articles for removing cuticle and stains; for cleaning, scouring and polishing compounds; for polishing hard rubber and fiber board; in toothpastes, and as an abrasive in rubber erasers. Large blocks of pumice are used locally for building stone.

As an abrasive for cleaning and scouring, pumicite has no equal. Such famous "dirt chasers" as "Old Dutch Cleanser" and "Kitchen Cleanser" contain about 98% fine white pumicite and 2% soap compound. So fine is the pumicite that it is not injurious to the hands, yet is very effective in removing dirt and grease. Pumicite finds a number of important uses as an abrasive in tooth-paste, silver powders, sweeping compounds, rubber erasers, mechanic's soap and polishing agents.

The newest and by far the most promising use of pumicite is that of a light-weight aggregate in building construction. Mixed with cement, in the proportion of five bags of cement to 40 lb. of pumicite per cubic yard of concrete, it is possible to turn out one of the best and cheapest concretes yet known to industry. Pumicite is a material that can readily be inserted in cement at the manufacturing plant. It has been used satisfactorily in portland cement concrete in a number of grain elevators, warehouses, irrigation dams and in highway construction. When used in the proper proportion in portland cement concrete, pumicite increases workability, density, water-tightness and strength; reduces honey-combing and checking in drying, requires less water for curing and costs the contractor less. The field for development in concrete is unlimited and includes all uses for portland cement concrete. It has been thoroughly tested and tried in the most difficult forms of work with splendid results.

Pumicite has also a number of minor uses, such as insulation for water and steam pipes; lagging for boilers; filler in paints; oil, water and vinegar filtration; as a non-conductor in sound-proofing, and as a catalytic agent in chemical reactions.

Production and Consumption

Table IV gives statistics on production and consumption of pumice and pumicite in the United States from 1910 to 1929, including imports of Sicilian pumice. Very little pumice is produced in the United States, production consisting almost entirely of pumicite. Production and consumption of pumicite in the United States is increasing, as shown by Fig. 2, and imports have been decreasing since 1920. During the world war imports of pumice were cut off and some 2000 short tons of pumice per year

*Analysis made by Walter H. Flood and Co., Chicago, Ill., September 10, 1928, for the Pumicite Co. of St. Louis.

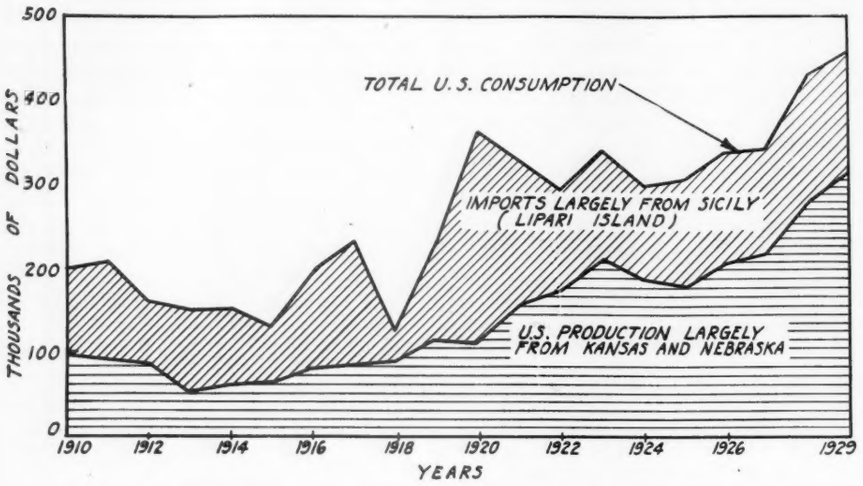

Fig. 2. Production and imports of pumicite in the United States

were produced in California in 1918 and 1919.

Conclusion

The cheapness of pumicite due to its great abundance and ease of preparation, and its remarkable abrasive qualities which make it such an effective cleaning and scouring agent indicate its increasing use for cleansing and scouring purposes.

The use of pumicite in light-weight concrete has been thoroughly tried and proven in actual construction, and the fact that it can be added to portland cement at the plant opens up a new and large field for its use.

The minor uses of pumicite as an abrasive, in insulation and sound-proofing and in filtration give considerable promise.

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TABLE IV. PRODUCTION AND CONSUMPTION OF PUMICE AND PUMICITE*

Year	Italy production, metric tons	United States					Total U. S. consumption, value
		Production			Imports		
		Short tons	Value	Price per ton	Short tons	Value	
1910	.....	23,271	$ 94,943	$4.08	.....	$104,425	$199,368
1911	.....	21,689	88,399	4.08	.....	118,977	207,376
1912	.....	27,146	86,687	3.19	.....	74,478	161,165
1913	14,793	24,563	55,408	2.26	7,480	93,408	148,816
1914	14,376	27,591	59,172	2.14	10,305	92,668	151,840
1915	10,242	27,708	63,185	2.28	9,066	65,691	128,876
1916	9,287	33,320	82,263	2.47	11,458	116,543	198,806
1917	11,312	35,293	84,814	2.40	11,103	147,278	232,092
1918	4,473	30,637	91,178	2.97	5,519	33,014	124,192
1919	13,210	36,051	116,835	3.24	.....	119,781	236,616
1920	25,200	41,838	114,433	2.73	.....	249,995	364,428
1921	10,900	37,108	158,540	4.27	.....	173,201	331,741
1922	.....	45,262	175,600	3.87	.....	118,458	294,058
1923	.....	56,575	214,169	3.68	.....	128,693	342,862
1924	.....	43,651	190,253	4.35	.....	111,284	301,537
1925	.....	40,380	179,020	4.43	.....	130,460	309,480
1926	.....	53,887	208,504	3.86	.....	129,449	337,953
1927	.....	53,298	221,481	4.15	.....	124,074	345,555
1928	.....	57,430	278,516	4.85	.....	159,430	437,946
1929	.....	60,873	318,579	5.23	.....	143,944	462,523

*Italian production and imports in short tons taken from Ladoo, R. B., Nonmetallic Minerals, 1925, p. 462. Other statistics contained in Mineral Resources of the United States, Part II, Abrasive Materials, Annual Publication of the United States Geological Survey. Value is value to producers at the mine.

The Testing of Mine Dusts

A STUDY of some 200 mine dusts indicates that per cent. of ash or incombustible dust is not a true guide to inflammability, A. L. Godbert and R. V. Wheeler report. Some 16 samples containing more than 50% of incombustible matter were still classified as inflammable, according to the test used. These tests emphasize the wide differences in inflammability of coal dusts and indicate the need of more discrimination in the use of incombustible dust as a precaution against coal dust.—*Chemical Abstracts.*

Asbestos, 1930

THE CANADIAN ASBESTOS output of 1930, produced entirely in the province of Quebec, suffered a considerable decrease from that of 1929, according to finally revised statistics just issued by the Mining, Metallurgical and Chemical Branch of the Dominion Bureau of Statistics at Ottawa. Sales of asbestos in 1930 amounted to 242,114 tons valued at $8,390,163 as compared with 306,055 tons worth $13.172,581 during 1929. This production represents a decrease of 20.9% in quantity and 36.3% in value below that of the previous year. Asbestos rock mined in 1930 amounted to 4,901,206 tons of which 3,737,780 tons were milled.

Seven companies operated in the asbestos mining industry in Canada and reported fixed and current assets of $35,-097,872.

The Department of Mines, Southern Rhodesia, reports a 1930 production of 37,766 tons of asbestos valued at 1,070,847 pounds sterling, or slightly over 28 pounds per ton compared with the preceding year, thus showing a decrease of 4,868 tons and 115,780 pounds in value. The decrease in tonnage may be attributed chiefly to marketing difficulties, partly resultant on foreign competition.

In the United States the commercial production of asbestos increased 84% in quantity but declined 14% in total value in comparison with 1929. With the exception of 1911, the 1930 production was the largest output of chrysotile ever recorded in the United States. The total quantity of this mineral sold or used by domestic producers amounted to 3,653 short tons valued at $273,292.

The Variable Effect of Phosphates

FROM DATA with phosphate fertilizers on winter rye for a period of 16 years on chernozem it may be seen that in years of good yields the phosphates are effective, whereas in poor years the phosphates have no effect, F. N. Germanov reports in a recent article. An analysis of the moisture factor shows that it is not directly responsible for this behavior. It is possible, however, that the moisture factor might indirectly affect the benefits from the phosphates. An analysis of the nitrate supply shows that it is highest during the fall, whereas during the spring and summer it drops to a minimum. Vegetation experiments with soils sampled during the fall and during the spring show that the fall soil responds very effectively to P treatment; the reverse is true for the spring-sampled soil. This seems to explain the erratic results obtained with P. fertilization. The nitrates are also not consistent from year to year, and whenever they are high, the phosphate is effective.—*Chemical Abstracts.*

Method and Cost of Quarrying Limestone at Quarry of Trinity Portland Cement Co., Fort Worth, Texas*

By J. William Ganser†
Chief Chemist, Trinity Portland Cement Co.

THE Trinity Portland Cement Co., of Dallas, operates three plants in Texas; one at Dallas, one at Fort Worth, and the other at Houston.

In the spring of 1923 W. H. L. McCourtie, president of the Trinity Portland Cement Co., became interested in the possibility of building a cement plant in Fort Worth to supply the rapidly growing demand for cement in west Texas. After considerable prospecting south and north of Fort Worth, it was decided that the best lime rock and shale for cement purposes were north of Fort Worth.

A property consisting of 600 acres, about 5 miles north of Fort Worth was obtained and ground was broken in the fall of 1923 for the machine shop and stock room. In order to get a building on the ground quickly the old power house at the Dallas plant was dismantled and set up at Fort Worth. This old building had housed three 750-hp. Allis-Chalmers gas engines, which were being dismantled because of a gas shortage which resulted in the installation of a waste-heat power plant at Dallas. After the erection of this building at Fort Worth the work progressed slowly until the spring of 1924, when machinery began to arrive. Gradually during the following months the required buildings were erected and the machinery installed. Operation was started in the early part of May, 1925, and the first clinker was ground into cement on May 23, 1925.

In the layout of the plant the plan was to have all the buildings as close to one another as possible and to have everything compact so as to require the least amount of labor.

The plant is directly adjacent to the quarry which is situated on a gradual slope to a small creek which usually is dry during the summer. The only vegetation on this slope was sparse grass and cactus, and as there was little soil no stripping was necessary before opening the quarry.

Geology

The rock and shale are of the Washita division of the Comanchean series of the Cretaceous period. The shale or marl is called Kiamitia, and the rock is called Lower and Upper Duck Creek limestone. The highest points on the quarry have a thin layer of Fort Worth limestone.

These formations dip from the northwest to the southeast, at an inclination of about 50 ft. to the mile.

The Kiamitia formation, as exposed under the Duck Creek limestone, is dark bluish, extensively laminated, and slightly calcareous. It is about 30 to 35 ft. thick and where exposed weathers readily.

The following is an analysis of the Kiamitia shale found directly under the Duck Creek limestone:

	Per cent.
Silica	52.80
Iron oxide	2.86
Aluminum oxide	14.24
Calcium carbonate	19.08
Magnesium carbonate	2.45
Loss on ignition	6.59

Only the upper 1 to 2 ft. of the Kiamitia shale is quarried, but it has been found through cores that the bottom portion, which is next to the Goodland limestone, is a dark blue clay marl with bands of sandy, calcareous material. In the middle section are thin limestone layers and several calcareous sandstone flag layers each 2 or 3 in. thick.

The Lower Duck Creek formation is a series of compact, soft limestone strata. It is about 35 ft. thick, and is characterized by a remarkable sequence of zones containing ammonites. These limestone strata are separated by many seams of a soft limestone 2 and 3 in. thick which easily disintegrate.

The following is an analysis of the limestone taken from one of these seams:

	Per cent.
Silica	21.80
Iron oxide	3.45
Aluminum oxide	13.15
Calcium carbonate	53.52
Magnesium carbonate	1.50
Loss on ignition	5.10

Analysis of the Lower Duck Creek limestone is as follows:

	Per cent.
Silica	6.02
Iron oxide	1.29
Aluminum oxide	3.38
Calcium carbonate	84.96
Magnesium carbonate	1.75
Loss on ignition	1.50

The Upper Duck Creek limestone or limy marl, at the present quarry face, is about 10 ft. thick. It is a light colored, yellowish marl containing a conglomeration of fragmental limestone and has the following composition:

	Per cent.
Silica	17.70
Iron oxide	2.80
Aluminum oxide	9.20
Calcium carbonate	64.22
Magnesium carbonate	2.09
Loss on ignition	7.00

The quarry was first opened on the rim of an amphitheater-like depression on the headwaters of a fork of Marine Creek which has cut back the Duck Creek and Kiamitia formations, thereby exposing the Goodland limestone in the creek bed.

Prospecting and Exploration

Previous to the purchase of the property considerable prospecting was done by persons expecting to interest someone in building a cement plant. What first probably attracted their attention was a 50-ft. face of rock on Marine Creek about one-half mile north of the present quarry. Rock from this bluff was completely analyzed by us before we bought the property lower down the creek.

From the analyses we were convinced that portland cement could be made from the rock in this locality. Two holes were drilled on the property, one 100 ft. deep and the other 64 ft. deep. The 100-ft. hole showed 80 ft. of limestone and marl and 20 ft. of shale; while the 64-ft. hole, which was drilled further down the slope, showed 48 ft. of rock and 16 ft. of shale.

Editors' Note

THIS paper is one of a series being prepared by the U. S. Bureau of Mines describing the mining and milling methods and costs at cement plant quarries throughout the United States.

These papers are designed to disseminate technical information regarding the methods used as well as costs. The cost tabulations represent local operating expenditures only and not total production costs.

At this plant an electric shovel is used for loading and the stone is transported in motorized cars controlled from a central point.—The Editors.

*Reprinted from U. S. Bureau of Mines Information Circular 6513.

†One of the consulting engineers, U. S. Bureau of Mines.

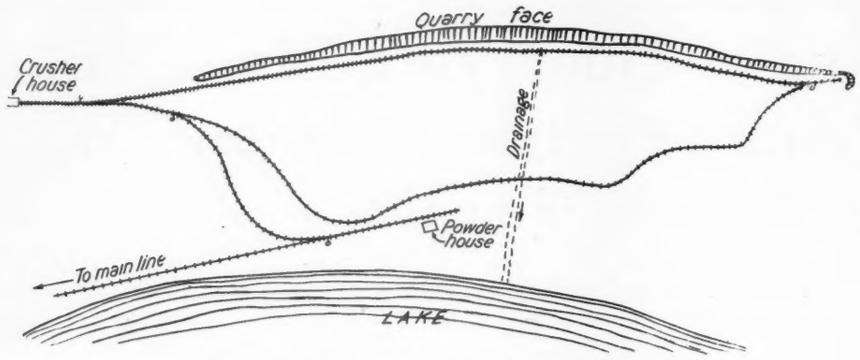


Fig. 1. Track layout and line of quarry face

After the property was purchased we drilled six holes with a Cyclone drill to get more data as to the quality and thickness of the limestone. Samples from these holes showed that we had from 20 to 45 ft. of rock over the area prospected. In each instance we drilled into the shale and all of the samples showed that it was quite uniform.

The following analyses were obtained on material from the deepest hole, each sample representing 5 ft. in depth:

ANALYSES OF MATERIAL FROM DEEPEST DRILL HOLE

Sample No.	Per cent. Silica	Iron and aluminum oxide	Calcium carbonate	Magnesium carbonate
Rock:				
1	7.62	4.74	85.11	2.01
2	14.18	8.18	74.96	2.51
3	14.16	8.48	72.28	1.42
4	12.62	8.80	75.57	3.37
5	12.10	6.92	77.21	3.19
6	13.38	8.60	75.82	2.74
7	12.96	8.24	74.64	1.71
8	8.94	6.16	81.16	3.00
9	7.26	3.32	85.53	1.45
Shale:				
10	35.68	15.76	44.50	3.39
11	38.88	14.66	40.09	4.04

In quarrying, little shale is mined with the rock and no shale pit is operated as is customary in other cement-plant quarries. The quarry face, which is 2000 ft. long, contains rock and marl low in lime at the end farthest from the plant and slightly high in lime at the near end. The low-lime and high-lime rock are stored separately and mixed by taking so many crane buckets of one kind to so many of the other and dumping them into the hopper which feeds the tube mill.

Choice of Method

The quarry location had a gentle slope and therefore in opening the quarry it was only necessary to shoot the rock and head the shovel into a face about 10 to 15 ft. high. At present the face is about 30 ft. high at the ends and 50 ft. at the center. The rock face is worked in a straight line. The overburden nowhere amounts to over 6 in. Of the 600 acres of land owned by the company 400 to 450 acres are available for quarry purposes.

Drainage of the quarry has been an easy matter since the floor of the quarry is higher than the creek bed and it has only been necessary to dig shallow ditches to carry the water to the creek. While some water stands in shallow pools in the quarry, it only softens the quarry floor to a depth of about 1 ft. There is a stratum of hard shale about 1 ft. under the limestone, which keeps the shovel and ties from sinking into the soft shale.

Fig. 1 shows how the track is laid out and the line of the quarry face.

Mining Methods

Since the overburden is only about 6 in. in depth it is not removed, but is mixed with the rock when blasted.

The quarry begins near the end of the plant and the face extends straight away from it; therefore, the haulage is short. The broken rock is loaded into cars by a No. 50-B Bucyrus electric shovel on crawler treads and having a 2-yd. dipper.

When the plant is running at full capacity it is necessary that the quarry operate 10 hr. per day, six days a week, producing from 1200 to 1500 tons a day. Only 6000 to 8000 tons of rock are shot down ahead of the shovel. The reason for this is to prevent the water-soaking of large quantities of rock in wet weather, because if the rock is thoroughly wet the marly part becomes sticky and it is difficult to handle in the preliminary crusher.

While the rock face is 50 ft. high at its maximum it is never this high after being shot. An effort is made to shoot the rock so that it is not usually over 30 ft. high in front of the shovel. The width of the shovel cut is about 40 ft.

Drilling and Blasting

The rock is drilled in the usual way by putting down well-drill holes, for which a 4-in. Sanderson-Cyclone drill is used, electrically operated and on tractor wheels. This drill is operated by a 15-hp., 440-volt, 720-r.p.m., variable-speed motor.

The holes are drilled 14 to 16 ft. back from the face and down to the shale. Only one row of holes 16 to 18 ft. apart is drilled at a time. These holes are shot one at a time, and only three or four are shot ahead of the shovel. This method of shooting was adopted to keep concussion to a minimum.

The drill bits are of tool steel, 4 in. wide with a 45 deg. slope on the drilling edge. Two men operate the drill 10 hr. a day and drill about 120 ft. These men are paid by the hour, one receiving 40 and the other 30 c. At this rate the labor cost is from 6¼ to 7 c. per foot drilled. As the holes vary from 20 to 60 ft. in depth, the amount of dynamite put into a hole varies. The maximum amount put into a 60-ft. hole is one box or 50 lb. All of the dynamite is put into the bottom of the hole, as it is the rock at the bottom that needs shattering. The top part —1 to 10 ft.—needs no shooting since it is a conglomerate of small rock and marl. When the bottom is shattered and pushed out by the shot, the top is easily broken up by the movement.

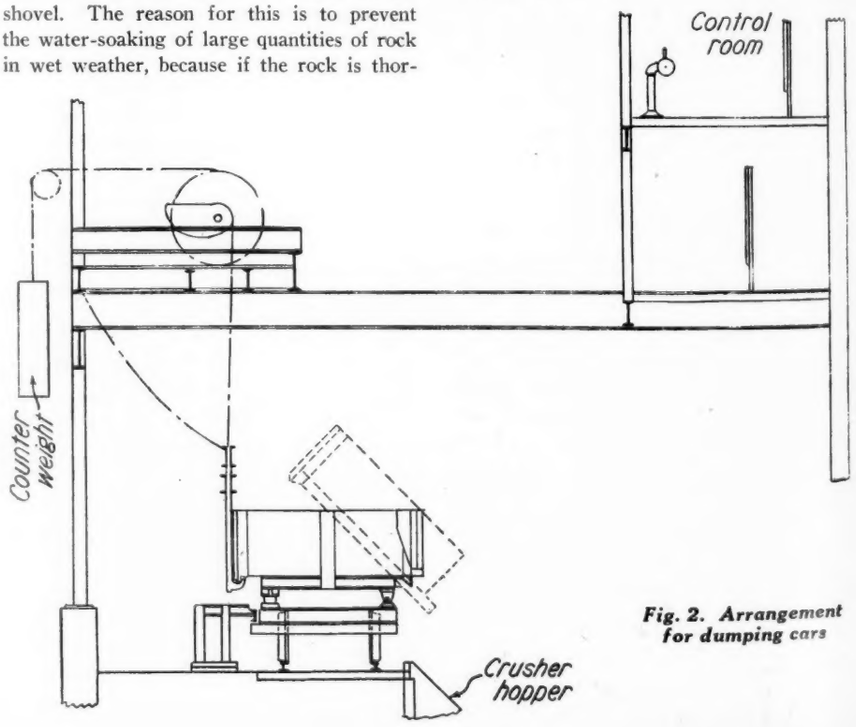


Fig. 2. Arrangement for dumping cars

The dynamite used in these drill holes is 4 by 8 in., 40% gelatin. Cordeau-Bickford is used on all primary shots and is set off with a No. 6 detonator. The holes are all loaded in the usual manner, and tamped with dirt by a wooden pole on a rope.

Very little secondary shooting is necessary. The few rocks that are too large for the crusher are laid aside by the shovel and at some later time are shattered by "doby" shots. From one to four 1¼ by 8 in. sticks of 40% gelatin dynamite are placed on the large rocks with a fuse about 30 in. long and covered with mud.

Loading Stone

All the stone is loaded by a No. 50 Bucyrus electric shovel with caterpillar tractors. A 100-hp., 2200-volt motor drives a generator which delivers 230-volt current to a 60-hp. motor on the hoist of the dipper, a 13-hp. motor which swings the shovel, and a 13-hp. motor on the thrust. A 5-hp. motor on the dipper trip, a 2-hp. motor on the air compressor and 7½-hp. motor on the exciter are run by 440-volt current received through a transformer from the 2200-volt leads. The Ward-Leonard system of control is used. It is necessary to have only one man on the shovel and one man in the pit, who removes large rocks that might fall on the track and also signals with a flag to the tower man as to where to stop the electric car and when to move it after it is loaded.

When the quarry was first opened a No. 32 Marion steam caterpillar shovel, with a 1-yd. dipper, was used. After several years this was too small to supply the quantity of rock necessary, and the bank became too high to operate so small a shovel safely. Since the crushing plant was being run entirely by electric power it was then decided best to purchase an electric shovel, thereby eliminating the necessity of maintaining a water line in the quarry and also the purchasing of coal.

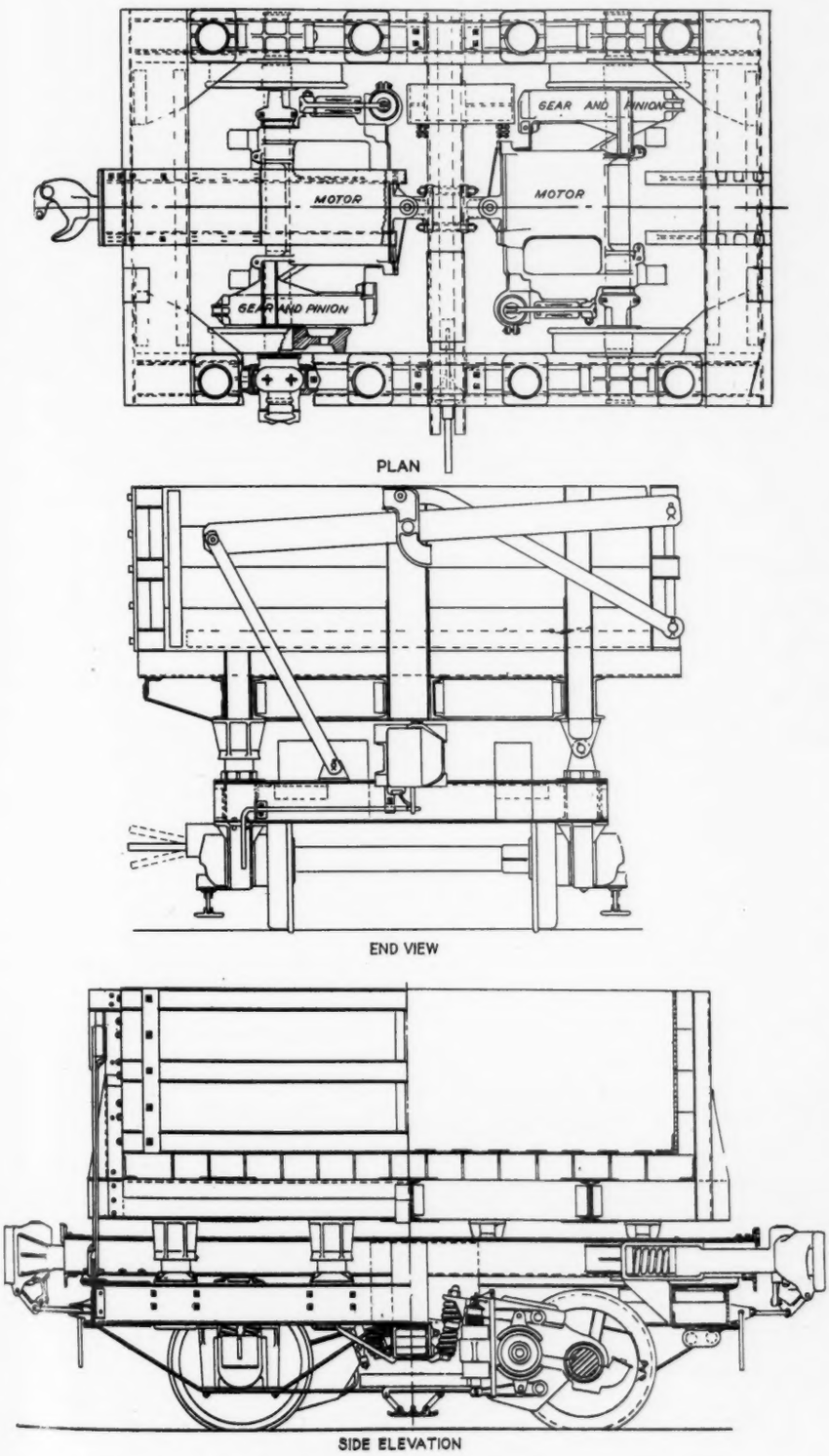


Fig. 3. Electric motor driven quarry car

Transportation

Transportation from the quarry to the plant is by the Woodford electric haulage system. It is controlled by an operator in a control tower which, in this instance, is in the plant where the cars are dumped.

The cars, of 10-cu. yd. capacity, were built by the Western Wheeled Scraper Co. They are of composite wood and steel construction and are the one-way, side-dump type. Each car has two 30-hp. Allis-Chalmers motors. Each motor drives an axle through direct single-reduction gearing. Three cars are being operated and each is equivalent in power to a 35-ton locomotive, as they will easily switch a box car of gypsum to the place of unloading. Fig. 3 shows the design of the cars.

The Woodford system employs a third rail using 250-volt direct current. In some installations this third rail is between the haulage rails, but at this property it is placed on the outside of the rails. It was found that the third rail, when between the two haulage rails, interfered when switching box cars; therefore the third rail on the whole system was placed on the outside.

Operation of the system is simple, as everything is in full view of the tower operator from the time the cars leave the crusher building until they are loaded and returned to it. Each controller provides for three running speeds, one off position for coasting and three brake positions for various brake pressures. With the controller handle in the off position a car will coast until the brake current is turned on. The controls are set so that the operator need not attend to the cars except for a few feet at the loading and discharge ends where they require accurate spotting. The three-speed control gives the cars a range of speed from 12 to 16 mi. per hr.

The track system consists of one track from the crusher house to a switch, and two branches from the switch to form a long loop. One side of this loop is parallel to the quarry face and is kept near it to serve as a loading track. The other is away from the face and is called the passing track. The usual method is to send empty cars out over the passing track and around the loop, spotting a car at the shovel as soon as the car ahead of it has been loaded and sent to the crusher.

The device which dumps the cars at the crusher is also operated by the tower man. It consists of two hooks which are attached to a frame and yoke. Two chains from this yoke go to cam-quadrants on which the chains wind as the quadrants revolve. The weight of the yoke and hooks is balanced by counterweights fastened to wire ropes which are wound on sheaves on the same shaft as the quadrant. When this shaft is turned by a motor (through gearing) the hooks are lifted, dumping the car sidewise, not only quickly but smoothly, and the car body is set back on the bolsters with very little jar. Fig. 2 shows the design of the car-dumper.

Crushing Plant

The cars are dumped into an 18 by 20 ft. steel-lined hopper from which the rock is discharged by a pan-type feeder (driven by a 5-hp. motor) to a No. 7 Mammoth Williams hammer mill, which is driven by a 250-hp., 2200-volt, 750-r.p.m. motor. The feed to the hammer mill consists of pieces ranging from a 3-ft. cube to ⅛ in. in size.

The discharge from the Williams mill is elevated by a 42-in. pan elevator, driven by a 25-hp., 2200-volt, 720-r.p.m. motor, and discharged onto a short belt 30 in. wide driven by a 5-hp., 440-volt, 720-r.p.m. motor. This carries the rock over a wall into the rock storage.

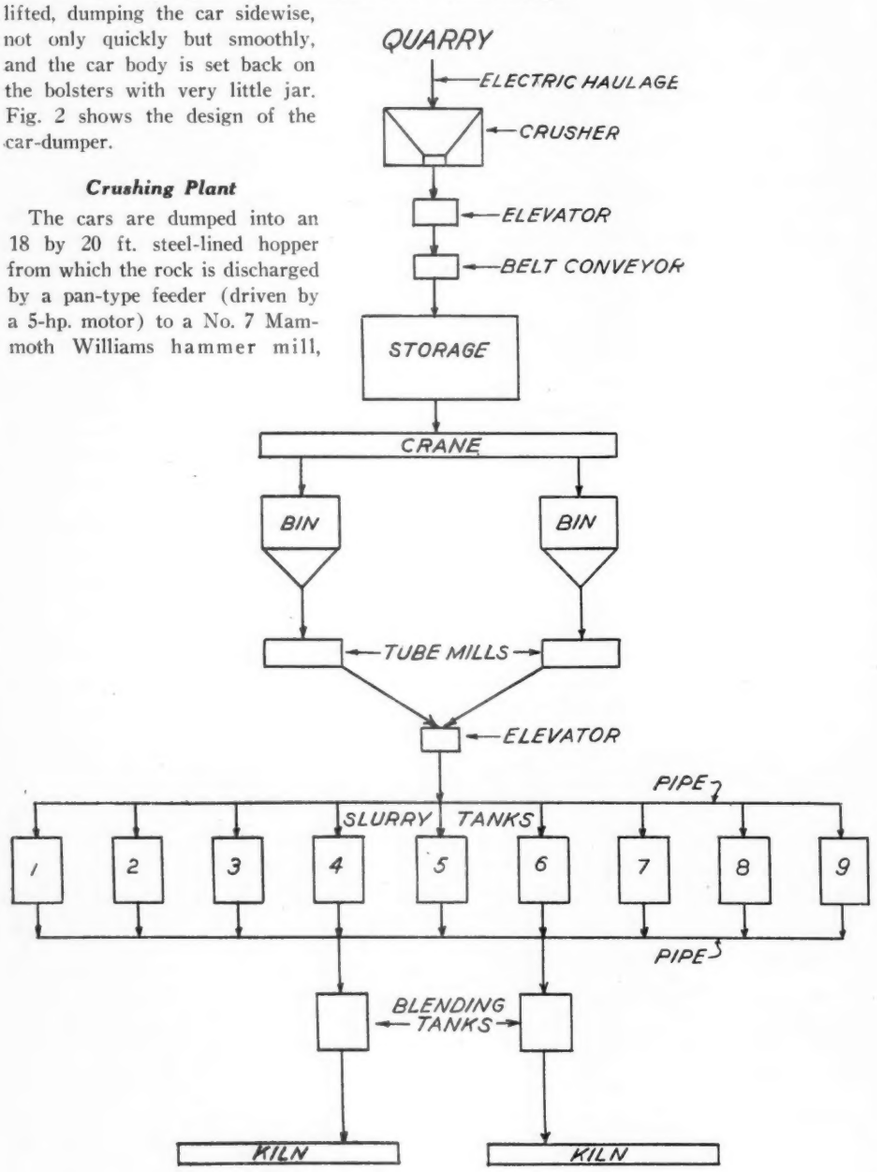


Fig. 4. Flow sheet

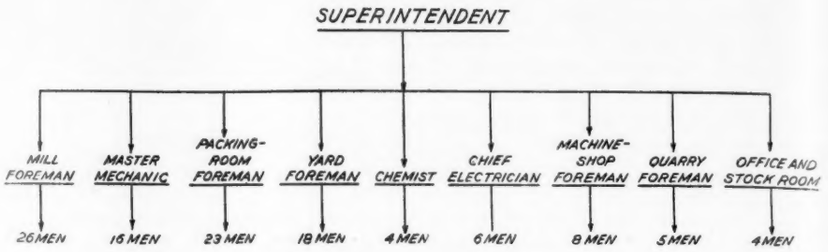


Fig. 5. Organization chart

Following is a screen analysis of the discharge from the Williams mill:

Size of mesh passed	Per cent.
1½ in	89.5
1 in	84.5
¾ in.	75.7
½ in.	67.7
¼ in.	59.0
⅛ in.	30.2
20 mesh	16.7
30 mesh	9.5
50 mesh	5.6
100 mesh	2.7

The rock after arriving in storage is either put into the section for low-lime or high-lime rock, or taken to the bins feeding the tube mills. The rock storage is 75 ft. wide and 178 ft. long and has a capacity of 10,000 tons. This rock is moved in storage by a Shepard 6-ton traveling crane equipped with a 3-yd. clamshell bucket. The crane has a span of 75 ft. and is equipped with a 10-hp. traveling motor, two 40-hp. hoist motors and a 40-hp. bridge motor. All of these motors have variable speeds and are operated on 4440 volts.

As already stated, the quarry is arranged so that high-lime and low-lime rock mixtures may be made. These mixtures can be further varied by adding different proportions of the rock from the crane bin, all of which makes for uniformity and for less correction after the raw material has been ground into slurry.

The two tube mills for grinding the raw mixture are adjacent to the rock storage and are fed from a hopper loaded by the crane. They are 8 by 30 ft. Traylor combination mills, each driven by a 700-hp., 2200-volt, 180-r.p.m. motor. These mills each have three compartments, so that the reduction is in three stages. The total weight of the grinding media per mill is 70 tons, consisting of 20 tons of 2-in. by 4-in. balls in the first compartment, 20 tons of 1½-in. balls in the second compartment and 30 tons of 1- by 1¼-in. slugs in the third compartment. The ball consumption per ton of material ground amounts to 0.304 lb. Tube-mill liners last from two to three years. The raw slurry from the mills contains 40% of moisture and 90% of it will pass a 200-mesh screen. The two mills grind at the rate of 29.39 tons per hour, or 14.70 tons per mill per hour.

The slurry from the mills flows to a bucket-elevator pit from which it is elevated to silos and agitated before being fed to the

kilns. Fig. 4 shows the flow sheet from the quarry to the kilns.

Wage Scale

No regular foreman is employed in the quarry, the superintendent, or mill foreman, supervising when necessary. The quarry men receive wages as follows:

Position	Number of men	Wages per hour
Shovel operator	1	$0.65
Pitmen	1	0.35
Driller	1	0.40
Driller's helper	1	0.30
Powderman	1	0.50
Crusher-tender	1	0.40
Crusher-tender helper	1	0.30
Towerman	1	0.60
	8	

Safety Organization

The idea of safety is being brought to the men at this plant in an unusual but impressive manner. Those found guilty of breaking safety rules appear at a court held each Monday morning and are tried for the offense. The following is a description of this court by J. M. Simmons:

A judge is elected to preside over the court, select the jury, appoint the prosecuting attorney and perform such duties as befall a judge in regular court. A sheriff is elected, who, incidentally, is a man whose regular duties as an employe require that he go through the entire mill several times a day. It is the duty of the sheriff to see if he can detect any employe doing a careless act or anything that may endanger himself or his fellow workers. Should he discover anything of this nature he files charges with the court clerk, who issues a notice to the man to appear at the next meeting of the court to answer the charge turned in by the sheriff. The sheriff also notifies any witnesses that he is able to find. Any employe in the mill can file charges, through the sheriff and court clerk.

At five minutes to 10 o'clock each Monday morning, at our regular safety period, the plant whistle blows, indicating that the men in each department selected by the department foreman are to appear in the court room—our regular first-aid room. The foreman has no trouble whatever in getting the men to come to the court, for they would all come if allowed.

The meeting is called to order promptly at 10 o'clock, and the minutes of the previous meeting are read by the secretary. We then have a short discussion on ways and means of preventing accidents, asking for suggestions from the men. Wet get our best recommendations from the men who do the actual work where hazards exist. These recommendations are put in the minutes of the meeting and are read the following week, giving account of those carried out.

The meeting is then turned over to the judge (shipping foreman), who opens the court by giving a brief talk on the purpose of the court stating that it is not intended to create any personal feeling, but that it is all in a spirit of fellowship and good will.

The judge then has the first case on the court docket read by the clerk, asks for corrections, appoints a jury, swears in the witnesses and turns the case over to the prosecuting attorney. The prosecuting attorney and the attorney for the defense (selected by the defendant) have 10 minutes each to question the witnesses of both sides and the defendant himself, and five minutes each to sum up and plead the case to the jury. When the defense rests the case, the jury retires to the jury room for not more than three minutes, after which time it returns a verdict of guilty or not guilty.

If the defendant is found guilty, the judge lectures the prisoner on safety work and particularly on safety work in line with the case just tried, which lecture incidentally is for the benefit of the entire court.

In the fall of 1929 practically the entire plant was given first-aid training by the U. S. Bureau of Mines. Since then six men have formed a first-aid team and have on several occasions entered first-aid contests in Fort Worth and Dallas.

ACCIDENT RECORD OF THE PLANT SINCE 1927

Year	Days lost per 1000 man-hours	Man-hours worked
1927	0.528	261,542
1928	0.109	301,378
1929	0.403	431,670
1930	0.000	371,752

Fig. 5 shows the organization chart for the entire plant.

TABLE III. DETAILED AVERAGE SHOVEL COSTS, DIRECT OPERATION, JANUARY 1 TO DECEMBER 31, 1929

(No. 50-B Bucyrus shovel, 2-yd. dipper. Stone loaded, 294,833 tons)

	Cost of stone—Total	Cost of stone—Per ton
Engineers	$ 3,002.25	$0.0102
Pitman	1,394.35	0.0047
Other operating labor	.....	.....
Total operating labor	4,396.60	0.0149
Fuel or power	454.12	0.0015
Grease and lubricants	199.29	0.0007
Coal—crane expense	735.50	0.0025
Total supplies	1,388.91	0.0047
Shovel—repair labor	1,587.40	0.0054
Repair supplies	1,283.96	0.0043
Total repairs	2,871.36	0.0097
Total shovel operation	8,656.87	0.0293

TABLE IV. DETAILED SUMMARY COSTS, DIRECT OPERATION, JANUARY 1 TO DECEMBER 31, 1929

	Cost of stone—Total	Cost of stone—Per ton
Total all shovels	$ 8,656.87	$0.0293
Drilling		
Operating labor	2,357.20	0.0080
Air, gas, power	69.90	0.0002
Operating supplies	168.50	0.0006
Repair labor	60.15	0.0002
Repair supplies	229.00	0.0008
Total drilling	3,723.23	0.0098
Blasting		
Labor	1,697.30	0.0058
Explosives	7,372.71	0.0250
Other supplies	.....	.....
Total blasting	9,070.01	0.0308
Haulage		
Locomotives	3,533.40	0.0119
Cars	1,531.31	0.0051
Track maintenance	8,359.58	0.0283
Haulage	13,424.29	0.0453
Grand total	$34,036.00	$0.1152

TABLE I. SUMMARY OF OPERATING COSTS PER DRY TON OF STONE MINED BY THE TRINITY PORTLAND CEMENT CO., FORT WORTH, TEX., JANUARY 1 TO DECEMBER 31, 1929

(Total material loaded during period: overburden included with stone, 294,883 tons of 2000 lb.)

	Labor	Air drills	Power costs	Explosives	Other supplies	Total
Mining:						
Drilling	$0.0082	$0.0008	$0.0002	.....	$0.0006	$0.0098
Blasting	0.0058	.....	.....	$0.0250	.....	0.0308
Loading	0.0203	.....	0.0015	.....	0.0075	0.0293
Transportation	0.0306	.....	0.0028	.....	0.0119	0.0453
Crushing	0.0139	.....	0.0087	.....	0 0121	0.0347
Grinding	0.0341	.....	0.1191	.....	0.0274	0.1806
Elevating	0.0029	.....	0.0005	.....	0.0048	0.0082
Conveying	0.0029	.....	0.0005	.....	0.0011	0.0045
Miscellaneous plant	0.0147	.....	.....	.....	.....	0.0147
Total operating costs	0.1334	0.0008	0.1333	0.0250	0.0554	0.3579
Depreciation	0.0300	.....	.....	.....	.....	0.0300
Depletion	0.0100	.....	.....	.....	.....	0.0100
Taxes	0 0100	.....	.....	.....	.....	0.0100
Insurance	0.0100	.....	.....	.....	.....	0.0100
Miscellaneous overhead	0.0200	.....	.....	.....	.....	0.0200
Total operating costs	$0.2134	$0.0008	$0.1333	$0.0250	$0.0654	$0.4379

TABLE II. SUMMARY OF COSTS IN UNITS OF LABOR, POWER AND SUPPLIES, JANUARY 1 TO DECEMBER 31, 1929

(Material loaded during period: overburden included with stone, 294,883 tons)

	Mining	Crushing	Total
A. Labor (man-hr. per ton)			
Drilling	0.0215	.....	0.0215
Blasting	0.0142	.....	0.0142
Loading	0.0330	.....	0.0330
Haulage	0.0534	.....	0.0534
Miscellaneous	0.0111	.....	0.0111
Total labor	0.1332	.....	0.1332
Average tons per man per shift	.....	.....	47.52
Labor, per cent. of total cost	.....	.....	37.24
B. Power and supplies			
Explosives (lb. per ton)	.....	.....	0.1639
Total power (kw.h. per ton)*	.....	.....	14.0196
Shovels	0.0015	.....	0.0015
Haulage†	0 0028	.....	0 0028
Drills	0.0008	.....	0.0008
Crushing	.....	0.0087	0 0087
Elevating	.....	0.0048	0 0048
Conveying	.....	0.0011	0.0011
Tube mills	.....	13.9999	13.9999

*Average cost of power is $.008 per kilowatt-hour.

†Power includes that used on both locomotives and electric haulage system.

Malay States Put Duty on Cement

IMPORT DUTIES on cement and tile were made effective at ports of the Federated Malay states November 11, the Department of Commerce has been advised by the consulate at Singapore.

The duty on cement is $8 a ton, and on tile $12 a ton.

These levies are made for the declared purpose of improving the financial position of the federated states.

Water Penetration Through Brick-Mortar Assemblages*

By L. A. Palmer†

EXPERIMENTAL TESTS INDICATE that the rate of water penetration through brick-mortar assemblages is not an additive function of the rates of water penetration through the separate materials, brick and mortar. Tests were made with two types of assemblages composed of two and four bricks respectively, with intervening ½-in. mortar joints, the mortar adhering to the brick. Penetration of water through the assemblages and separate materials was effected by maintaining an average head of water of from 1⅛ to 4 in. The maximum head varied from 2¼ to 8 in. Very rapidly absorbing brick and portland cement-sand mortars were used. The proportions by volume of cement and sand in the mortar were varied. The results indicate that with no openings or shrinkage cracks between mortar and brick, water penetration into the interior of 8-in. walls is extremely improbable under normal climatic conditions even when the bricks and mortar are relatively very permeable if plaster is not applied directly on the brick.

The rates of water penetration through the separate materials, brick and mortar, and through assemblages of these materials have been studied. Two types of brick were used. In one, the total absorption, as determined by immersion for 48 hr. in water, ranged from 17 to 24.5%. The other type of brick had a range of total absorption of from 4 to 9.8%. Both types were very rapidly absorbing. The mortars used were made from one sand and one portland cement. Three mortar mixes were used, 1:2, 1:4 and 1:6, the numbers referring to proportions by volume of cement to sand respectively. The brick-mortar assemblages were composed of either two or four bricks. Water penetration was effected by maintaining a constant head of water in reservoirs of which the test specimen constituted a side. The time-distance relation of water penetration was considered. It was found that with intervening mortar joints between bricks, the rate of travel of water was greatly reduced. Water penetrated through the width of the bricks in from 2 to 11 min. when tested singly. The rate of flow of water through mortar specimens tested singly varied from 2 to 14 min. per ½ in. of mortar material, depending upon the proportions of cement and sand.

*Publication approved by the Director of the Bureau of Standards of the U. S. Department of Commerce.

†Research Associate, American Face Brick Association, at the U. S. Bureau of Standards, Washington, D. C.

Author's Note

EXPERIMENTAL TESTS indicate that the rate of water penetration through brick-mortar assemblages is not an additive function of the rates of water penetration through the separate materials, brick and mortar. Tests were made with two types of assemblages composed of two and four bricks, respectively, with intervening ½-in. mortar joints, the mortar adhering to the brick. Penetration of water through the assemblages and separate materials was effected by maintaining an average head of water of from 1⅛ to 4 in. The maximum head varied from 2¼ to 8 in. Very rapidly absorbing brick and portland cement-sand mortars were used. The proportions by volume of cement and sand in the mortar were varied. The results indicate that with no openings or shrinkage cracks between mortar and brick and if plaster is not applied directly on the brick, water penetration into the interior of 8-in. walls is extremely improbable under normal climatic conditions even when the bricks and mortar are relatively very permeable.—The Author.

From 3 to 8 hr. were required, however, to wet through two brick assemblages containing ½-in. mortar joints between the bricks. It is believed tha swelling of the colloid matter in the cement (tending to obstruct the voids) on continued wetting, together with breaking the continuity of voids by interposing mortar joints between brick, accounts in part for the slowness of travel of moisture through the assemblages. Another possible factor is the fact that a certain degree of saturation must be reached in a brick before it can transmit its moisture to another material. This degree of saturation is not attained when water has merely traversed the length or breadth of the brick. It is concluded that with proper workmanship and design of walls it is extremely improbable that wet interiors will be had in solid 8-in. brick walls in climates where normal rainfall prevails. It may be necessary in some cases, however, to avoid plastering directly on the brick.

Water Penetration Through Brick-Mortar Assemblages

The purpose of this study was to find any relations which might exist between the rate of water travel through brick-mortar assemblages and through the separate materials, brick and mortar.

There are a number of brick on the market which wet through very quickly. Occasionally it has been said that header brick of this type will transmit moisture into the interior of an 8-in. wall., when the plaster has been applied directly on the brick and when the rain is prolonged and carried by a fairly heavy wind. A little consideration should enable one to see that plastering on brick in any 8-in. wall in a climate where there is normal rainfall, be the absorption properties of the brick what they may, is an unwise and dangerous procedure. Even though the brick may be extremely impervious, there is always the danger of water penetration through cracks and open spaces between mortar and brick. These may be the direct result of careless workmanship or of differential volume changes in the two materials, brick and mortar. This condition, however, is not the rule. Dry wall interiors are had with both impervious and porous brick. From the standpoint of keeping out water, there is no good reason for selecting brick that are less permeable than the mortar. Furthermore, it has been observed that relatively porous brick may be as weather-resistant as any other kind.‡ A few careful considerations should make it obvious that there is a doubt as to anyone's ability to predict, with any reasonable degree of accuracy, the penetrability of a brick wall on the basis of known absorption properties of the brick and mortar alone.

It is a well-known fact that with a thin sheet of celluloid between two glass plates, the "assemblage" has properties quite different from those of a single glass plate of the same thickness. Reinforced concrete has properties which differ somewhat from the separate materials, concrete and steel. A bushel of baseballs and a bushel of sand may be mixed together, but the combined bulk volume of the mixture is not two bushels. One cannot predict with any degree of accuracy the electrical conductivity of an alloy of two metals on the basis of known conductivities of the separate metals. How, then, may one predict the rate of water penetration of a brick wall on the basis of known rates of penetration through the separate materials, brick and mortar? Properties of

‡"Some Results of Freezing and Thawing Tests Made with Clay Face Brick": L. A. Palmer and J. V. Hall; Proc. Am. Soc. for Testing Materials, Vol. 30, Part II, p. 767.

mixtures and assemblages are not necessarily additive.

For example, suppose that water under a definite pressure (say a 3-in. head reckoned from the mid-point of the edge of the brick) travels from one edge of the brick to the other, a distance of 3¾ in., in 4 minutes. Suppose that it travels through a mortar at the rate of 1 in. per 5 min. under the same head. Then suppose that a second brick wets across in the same time as the first when tested singly and under the same conditions. If the two edges of these two bricks are bonded together with a ½-in. joint of this mortar, in what time will the assemblages be penetrated transversely by water?

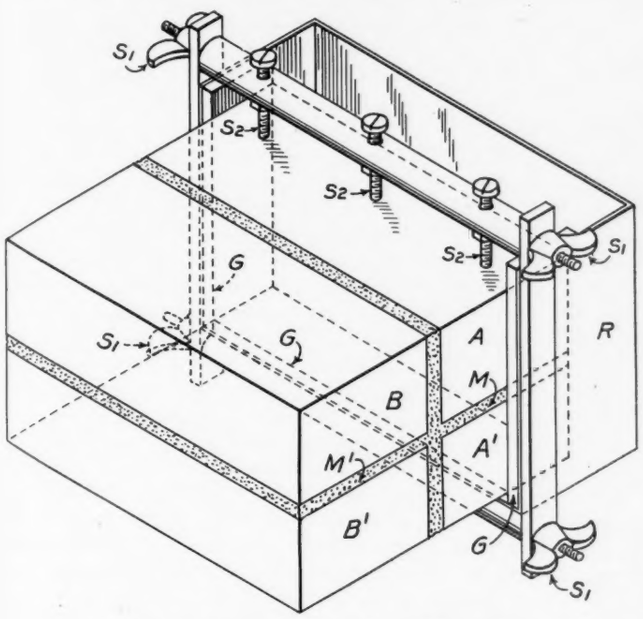


Fig. 1. Apparatus used in making tests

The purpose of this investigation was to find an answer to this question.

Materials Used

Two manufacturers' shipments of brick were used in these tests. Both were molded by the dry-press method. One was made from surface and the other from fire clay. Bricks of both shipments were extremely rapidly absorbing. The two types of brick differed markedly from the standpoint of total absorption. One portland cement and one sand were used and the proportions by volume were varied. The sand was a fairly well-graded mortar sand which had all passed a No. 8 sieve and was practically free from silt and organic matter. The portland cement met the requirements of federal specifications for portland cement as contained in Bureau of Standards Circular 33, 4th edition.

Test Procedure

Metal "reservoirs" of the type *R* in Fig. 1 were used to ascertain the rate of flow of water through brick alone, mortar alone, and through assemblages of brick and mortar. These "reservoirs" were made in various sizes and shapes to fit over the end or edge of an assemblage. All were open at the top. Rubber gaskets, *G*, fitted tightly against the test specimen on bottom and sides when the screws, S_1 and S_2, were tightened. The rubber gaskets were cemented to the metal container or reservoir by a rubber cement.

Water was poured from a beaker into the open top of the reservoir until level with the upper surface of the specimen. Constant level was maintained by syphoning water through a glass tube from a carboy. The glass tube was fitted with a stop-cock and the flow into the reservoir could be increased or lessened according to the rate at which water left the reservoir and entered the test specimen. The average head was taken as one-half the depth of water.

Total absorption was determined by first drying the brick in an oven at about 150 deg. C., then, after cooling, soaking them in water at room temperature for 48 hr. Total per cent. absorption equals the gain in weight during soaking multiplied by 100 and divided by the dry weight.

In determining the rate of absorption on bricks alone, the time-distance relationship (rather than the gain in weight per unit time) was considered.

Three different mortar mixes were studied. These were 1:2, 1:4 and 1:6 mortars, the numbers referring to volumes of portland cement and sand, respectively. One cement and one sand were used in all of these tests. The joint thickness was approximately ½ in. in all cases. The rate of flow of moisture through mortar alone was studied with specimens of mortar of approximately brick size.

The bricks used to form an assemblage with mortar were wetted immediately before mortar was applied. This wetting was effected by placing the brick flat side down in a pan of water. The brick was considered to be "wetted" when the entire upper surface was damp. In most cases such dampness could be seen. In case any doubt existed, a little powdered lime was dusted on the surface. Any wetting of the lime was very noticeable to the eye. After forming the assemblage it was dried in the laboratory for two weeks. Drying was hastened by setting it in front of an electric fan, keeping the latter in continuous operation. The specimen was then ready for a permeability test.

In this study of moisture penetration the time for wetting through (a brick, mortar specimen or assemblage) was arbitrarily defined as the time elapsing from the moment water was applied on one surface until any part (small or large) of the opposite surface was wetted. The time for this to happen was estimated by means of a stop-watch and the wetting process was observed continually from start to finish.

Results

(1) *Total Absorption*—The total absorption of brick No. 2 made from fire clay ranged from 4 to 9.8%. That of brick No. 1 made from surface clay ranged from 17 to 24.5%. These values are based on 24 tests made with 24 bricks of each type.

(2) *Rates of Water Transmission*—In Table I are given the results obtained by exposing one edge of the individual bricks to water and observing the time taken for water to emerge at any spot on the opposite edge. The horizontal distance of flow was approximately 3¾ in. in all cases. The average head was half the thickness of the brick, i.e., 1⅛ in.

Pairs of bricks of one make, No. 1, bonded together, edge to edge, with a ½-in. joint of 1:2, 1:4 and 1:6 mortar, were then tested. Then pairs of the other make, No. 2, were similarly tested. The average times required for water to cross the single bricks, the ½-in. joints, and the two brick-mortar assemblages, are given in Table II. These rates were determined by observing the times taken for water to traverse mortar specimens (of approximately standard brick shape and size) from one edge to the other. The total time taken for water to cross the "mortar brick" (a distance of approximately 4 in.) divided by 8 was taken as the time of flow through a distance of ½ in. in this material.

It may be noted in Table II that the 1:2 mortar was much more impermeable than the 1:4 and 1:6 mortars. In the 1:2 mortar the initial rate (through first inch) of penetration was much greater than any other. The retardation in the rate of travel may have been due to swelling of the cement particles on hydration. This occurrence was not very noticeable in the more permeable 1:4 and 1:6 mortars.

By adding the times required for water to traverse two bricks, each tested separately, to that required for penetration of ½ in. of mortar, Table II, one gets what might be

TABLE I. RATE OF WATER TRANSMISSION THROUGH BRICKS
(24 bricks tested in each case)

Manufacturer's brick	Time for wetting through, edge to edge: Average Min.	Average Sec.	Maximum Min.	Maximum Sec.	Minimum Min.	Minimum Sec.
No. 1 (made from surface clay)	3	36	6	10	1	55
No. 2 (made from fire clay)	10	20	15	45	4	45

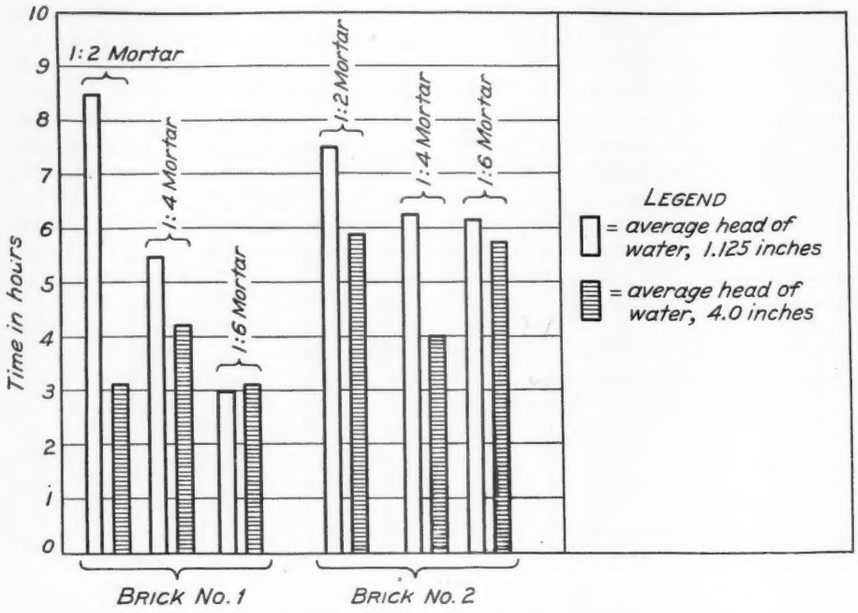


Fig. 2. Effect of varying head of water

predicted as the time of penetration of the assemblages on the basis of known rates of permeation of water through the materials, brick and mortar, tested separately and out of contact with one another. On this basis one would predict that the assemblages made with No. 1 brick and 1:4 mortar would wet through within a time not greater than 8 minutes (for the two bricks) added to 2 minutes (for the ½-in. joint), that is, 10 minutes. The fact that the average time was 5 hours and 29 minutes indicates the danger of predicting, without data, how water may penetrate brick masonry.

Effect of Varying Pressure

The effect of varying the water pressure is illustrated in Fig. 2. Here the heights of the columns not shaded are the average times taken for water to penetrate through the two brick-mortar assemblages, brick lying flat side side down. The average head was half the thickness of brick of standard size, or 1⅛ in. The heights of the shaded columns are the average times required to wet through these assemblages stood on end, i.e., under an average head (or pressure of water) of 4 in. or one-half the length of a brick of standard size. The height of any column in Fig. 2 represents the average of six tests. In all except the 1:6 mortar there was an appreciable increase in the rate of flow of water through the assemblages when the head was increased from 1⅛ to 4 in. In most cases the time for penetration was decreased as the leanness of mortar was increased.

There are, however, a few interesting anomalies in Fig. 2. These can only be explained on the basis of theory, and a brief discussion of this is reserved for a later part of this paper. It need only be mentioned now that the continuity or connectivity of pores in complex assemblages of masonry materials is subject to the laws of chance or probability. Any existing definite and quantitative relations could only be known after a very large number of such tests. Obviously, the rate of penetration would increase with the number of pores or voids which connect directly (but not necessarily in a straight line) across the assemblage, i.e., from brick-to mortar-to brick. This degree of communication of voids would be subject to the laws of chance. It is admitted, however, that there may be other explanations as good as this one.

Fig. 3 illustrates the comparative rates of penetration by water of the following: curve (1) a single brick of type No. 1, curve (2) a "mortar brick" made with 1 part of portland cement and 4 parts of sand, and curve (3) the same clay brick used to obtain curve (1) in the outer position (second brick) of a two brick-mortar assemblage. The average water head was 1⅛ in. in all three cases. Water traveled through the first brick of the assemblage (data not plotted), whose edge formed a side of the rectangular reservoir in about 5 min. There was a delay, then, of about 20 min. before the joint became noticeably wet in any part. At the end of a half hour the joint was wetted through. There was then a delay of about 15 min. before there was any visible sign of water entering the second (outer) brick. As it traveled through this brick the times for wetting through each quarter of an inch were recorded. Water was "fed" to this brick slowly and the rate of flow through it in the assemblage is represented by curve (3).

In estimating the rate of penetration the specimens were ruled with a colored crayon at ¼-in. intervals, both on top (horizontally) and on ends (vertically). It was considered that penetration through any ¼ in. of material had occurred when any point on the lines was reached by water.

Were the time-distance relation for the entire assemblage plotted on the same curve, it would not be a continuous curve by any means. There would be a marked discontinuity at points where continuity of materials was broken.

Testing of Four Brick Assemblages

Fig. 1 illustrates how assemblages composed of four bricks were tested. In this case the average head was the thickness of one brick plus half the thickness of a mortar joint, or 2½ in. Obviously water could travel directly through mortar along the route, *MM'* in this case. There would likely be better pore communication along this route than through brick *A*, thence through ½ in. of mortar, thence through brick *B*. The results obtained by testing assemblages of this kind are given in Table III. Water rose by capillarity from the permeable 1:4 and 1:6 mortars into the upper bricks *A* and *B* and was carried both by gravitational and capillary forces from these mortars into the lower bricks, *A'* and *B'* (Fig. 1). The four brick assemblages were more permeable than those formed with only two bricks (which would

TABLE II. RATE OF PENETRATION OF WATER THROUGH TWO BRICK-MORTAR ASSEMBLAGES

(Brick lying flat side down, water entering one and traveling through to the opposite edge. Average head, 1⅛ in. Values are averages of six tests)

	Average time taken for water to penetrate													
	Through width of each brick tested separately		½ in. of mortar tested separately						Two brick-mortar assemblages					
			1:2 mortar		1:4 mortar		1:6 mortar		1:2 mortar		1:4 mortar		1:6 mortar	
	Hr.	Min.	Hr.	Min.	Hr.	Min.	Hr.	Min.	Hr.	Min.	Hr.	Min.	Hr.	Min.
No. 1 (made from surface clay)	0	4	0	14	0	2	0	⅘	8	33	5	29	3	17
No. 2 (made from fire clay)	0	8	0	14	0	2	0	⅘	7	30	16	15	6	10

TABLE III. RATE OF WATER PENETRATION THROUGH ASSEMBLAGES OF FOUR BRICKS

(Average head of water, 2¼ in. Values are averages of three tests)

	Average time for penetration of water through													
	Mortar Joint, MM						Lower Bricks, A'B'						Upper Bricks, AB					
	1:2 mortar		1:4 mortar		1:6 mortar		1:2 mortar		1:4 mortar		1:6 mortar		1:2 mortar		1:4 mortar		1:6 mortar	
Brick	Hr.	Min.	Hr.	Min.	Hr.	Min.	Hr.	Min.	Hr.	Min.	Hr.	Min.	Hr.	Min.	Hr.	Min.	Hr.	Min.
No. 1	2	0	1	22	0	59	3	10	2	24	3	25	5	47	5	51	2	48
No. 2	2	18	1	6	0	48	7	0	3	15	2	45	6	30	3	15	6	37

be the upper or lower half of the assemblage shown in Fig. 1, and without the mortar joint, MM').

The data indicate that usually the rate of moisture penetration was somewhat less in the 1:2 than in the leaner mortar assemblages. This apparent advantage may be offset by other undesirable features characteristic of such rich mortars. This is indicted by the behavior of some of the test specimens. There were four instances of failure of bond with 1:2 mortar and none with the 1:4 and 1:6 mortars. These failures occurred during the drying of the units after forming them, and it is believed that differential shrinkage caused this failure. The tests were made only with assemblages wherein there was no indication of any bond failure. That there was not bond failure in the case of all assemblages made of 1:2 mortar might be explained by the fact that there was considerable variation in the rate of drying, due to fluctuations in the relative humidity of the air in the laboratory. Another interesting point is that the bond failures took place in the two-brick and not in the four-brick assemblages. The latter would of course tend to dry more slowly.

Discussion

A brick is not saturated when the process of wetting through by capillarity is just completed. Proof of this statement may be found in numerous publications. Probably the most thorough consideration of this point was given by McBurney.* In his publication McBurney has presented data giving absorption percentages of various makes of brick during different intervals, as obtained both by partial and complete immersion of the bricks. After water has penetrated entirely through a brick by capillarity, there is further absorption (as the test is continued), but the rate of such further absorption is exceedingly slow, whether the brick when dry absorb rapidly or not. One may therefore ask the very pertinent question, What extent of saturation must be reached before the brick can transmit water to another material, such as mortar, plaster, etc.? Unless one can give an intelligent answer to this question he can make no reasonable prediction as to possible dampness on the interior of a wall on the basis of known absorption properties of the brick to be used therein.

When a rapidly absorbing brick is wetted through and yet has not reached its full degree of saturation (such as is produced by prolonged soaking) its behavior on further wetting is very similar to that of a completely dry and very impervious brick. However, whether they are saturated or partially saturated, rapidly and slowly absorbing bricks have very dissimilar drying properties. Although the initial rate of drying from the wet surfaces are nearly equal in the two cases, the more slowly absorbing brick retains the last bit of its absorbed moisture more tenaciously than the more rapidly absorbing type of material.

In the present study, bricks Nos. 1 and 2 were very similar from the standpoint of rate of absorption. However, the total amount of water absorbed by any specimen of type 1 was very much greater than that absorbed by any of the other manufacturers' material. The rates were alike, but the capacities were markedly different. One would naturally consider that a fast absorbing brick of low water capacity would contribute to the condition of leaky walls, but there is nothing to be found in the above data to indicate that this is the case. Neither bricks of low nor high capacity are saturated when merely wetted through. This property is common to all bricks.

The following explanation of the slowness of water transmission through fast absorbing bricks with an intervening mortar is offered. First, there is the factor already discussed, i.e., brick that can still absorb more water (although wetted through) do not transmit moisture to another material unless that other material has a strong affinity for water. Anhydrous calcium chloride in contact with brick would make such an exception. Blotting paper is another exception and for a different reason. Mortar, however, is probably not an exception, at least to any marked extent.

Secondly, cement mortar (concrete also) transmits water more and more slowly as it is kept wet. This may be due to swelling of the colloid particles, and is more noticeable in a rich than in a lean mortar mixture.

The third consideration is that of pore communication. If the probability that any single pore or void in a brick communicates directly with any single pore in the adjacent mortar, is P, and if in turn the probability that this pore in the mortar connects directly with one in the second brick is also P, then the probability that any single pore of the first brick communicates with others through the 8-in. wall is P^3. If P is one chance in ten, thence P^3 is one chance in 100.

Fourth, the fine cement particles may be sucked into the voids of the brick. This theory was given a test. Bricks covered with a brush coat of neat cement wetted through in the same time as they did without the coat. However, when two bricks were bonded together with neat cement, it was impossible to get water through the assemblage in less than 8 hours without considerable pressure.

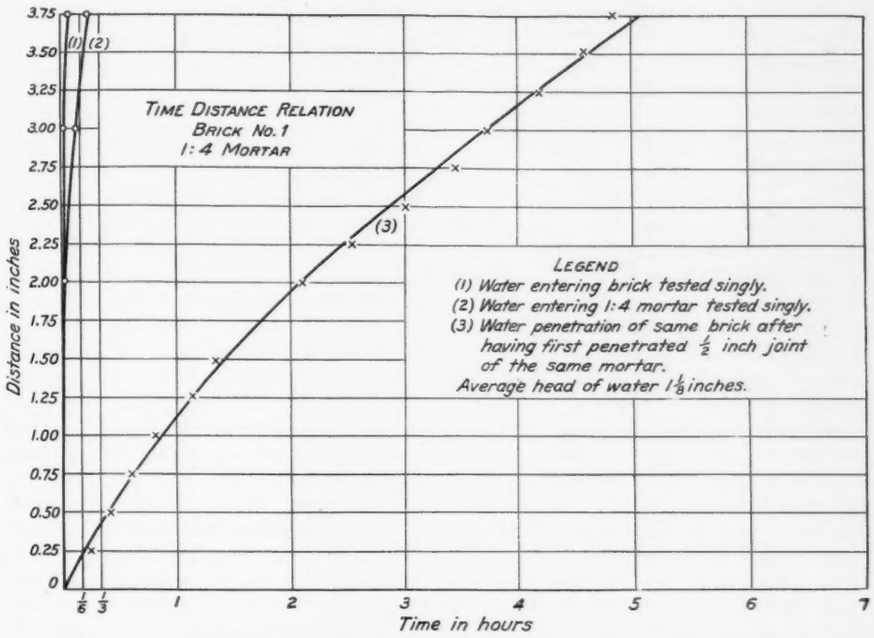


Fig. 3. Comparative rates of penetration of single brick, mortar and outer of two brick assembly

Of these four possible factors it is believed that the first three mentioned are all important and account for the slowness of penetration by water of the assemblages made with very rapidly absorbing bricks.

By process of elimination, leaky brick walls must be due to the presence of cracks and openings between the bricks and mortar. Of course, a fast absorbing header brick may transmit moisture to the plaster if applied directly to the brick in an 8-in. wall. The fault in this case is in the construction. Furring 8-in. walls is becoming an almost general practice and is advantageous from the standpoint of heat insulation. In Great Britain header brick are seldom used, metal ties being used instead.

Wind pressure may be computed approximately from the following equation found in engineering handbooks: $P = AV^2$. Here P is the pressure in lb. per sq. ft. on a plane surface normal to the direction of the wind, A is a constant, 0.003, and V is the wind velocity in miles per hour. The maximum heads in the experments described above

* "The Water Absorption and Penetrability of Bricks": J. W. McBurney; Proc. Am. Soc. for Testing Materials, Vol. 29, Part II (1929), p. 711.

were 2¼ in. for the two brick and 5 in. for the four brick assemblages, laying with flat sides of brick down, and 8 in. for the two brick assemblages with the bricks on end. A head of 2¼ in. of water is equivalent to a wind velocity of 62 mi. per hr. Similarly, a head of 5 in. of water is equivalent to a velocity of 93 mi. per hr. and one of 8 in. is equivalent to a velocity of 118 mi. per hr. This is with reference to wind pressure without rain. The effect of the horizontal and vertical components of the velocity of raindrops are neglected in estimating these equivalent pressures. It is believed that under these conditions of test the degree of exposure of surface to water was greater than that which usually obtains at the surface of a vertical wall and under any normal climatic conditions. Consequently, with no open spaces a vertical 8-in. brick wall would most likely not be wetter through under any such normal conditions. An added protection against unusually severe storms would be to fur the wall.

Summary

The rates of water penetration through the separate materials, brick and mortar, and through assemblages of these materials, have been studied.

The data indicate that when continuity of material is broken the rate is markedly decreased. The speed of wetting was greatly reduced by intervening mortar joints. This was true both with lean and with rich mortar.

These data were obtained with extremely fast absorbing types of brick. It is believed, therefore, that the times recorded for wetting through the assemblages are minimum values that would be obtained were the study extended to include a wide variety of clay and shale bricks.

It is improbable that water will be transmitted through solid 8-in. walls of brick if there are no open spaces between mortar and brick and if some provision is made in so designing the wall that header brick do not connect directly with the interior. This may be had by furring the inner wall or by the use of metal ties in place of headers.

Acknowledgments

Gratitude is felt for the many helpful suggestions received and for the interest shown by various members of the staff of the Bureau of Standards during this study, and to J. W. McBurney, research associate for the Common Brick Manufacturers' Association, who has stressed the necessity of considering absorption rates.

Testing Green Concrete Roads to Relieve Eye Strain

GREEN CONCRETE roads, easy on the eyes, may be a development of the future.

"White concrete roads are tiring in the daytime to motorists, because of the eye strain," said Dean Albert Fitch, of Pennsylvania State College of Optometry, in a speech at Boston recently. "Dark roads are also hard on the eyes, because it is difficult to make out the roadway easily. This causes eye strain.

"Green mixtures of concrete, with which we are now experimenting, will relieve the strain on the eyes when driving in bright sunlight."—*New York* (N. Y.) *Herald-Tribune.*

Cement Makers of Venezuela

VENEZUELA has an annual consumption between 875,000 and 1,250,000 bbl. of portland cement, with value from $1,500,000 to $2,000,000. As there is only one cement plant in the country, the greater part of the supply comes from foreign countries, the leaders in this trade being Belgium, the United States, Germany, the Netherlands, Denmark and Great Britain. During 1929 these countries ranked in the order named, but there is a great deal of variation in their relative positions from year to year. Statistics available do not indicate any marked or steady growth in the use of cement in Venezuela. It appears likely that imports in 1931 will prove to be less than those for any of the three preceding years.

The principal consumers of cement in Venezuela are the oil companies and the government, and what they use in the future will depend largely on general economic conditions. Reinforced concrete is the most favored type of construction where funds permit its use.

The position of the United States among the leading suppliers of cement to this market may be attributed largely to the fact that many of the oil companies are subsidiaries of American companies and place orders through their home purchasing offices. In the general market, most grades of American cement cannot compete in price with foreign brands, although it seems likely that American sales could be increased.

Officials of the one local cement company say that during the past three years it has been operated both day and night, and has produced 15,000 bbl. every month.

There seems to be little difference in the quality and price of cement. The question of selling depends on other factors. Among the oil companies the custom has been for the companies controlled by European capital to buy in Europe, those controlled by American capital to buy in the United States. The American brands have a disadvantage in being put in paper or cloth bags, since the long standing custom in Venezuela favors the European barrel. In addition, Europeans will accept 60 or even 90 day terms, drafts or open accounts, while American companies insist on cash or short term payments. The facts that many American companies are interested in the export trade only intermittently when the domestic demand is slack, and that their representatives sometimes have no knowledge of the Spanish language are further drawbacks.

Consumption of cement in Venezuela depends principally upon the activity of the oil companies and the government. There is no indication as to when the oil companies, now producing as little as possible, may resume normal operations. The government closed its building program in 1930, and there is no indication as to when it may undertake another, although a number of projects are under consideration.

It seems likely that the sale of American cement in this market could be materially increased, if American manufacturers will work in harmony. American manufacturers would do well to fix one price, the same terms, discounts and commission, and then direct their united efforts to compete with foreign manufacturers on a quality basis. This is primarily a price market, and Americans should try to get their prices as low as possible and then stick to the same quotations and terms.

Under the Venezuelan customs law, an allowance of 3% is permitted in the declared weights. It is said that foreign manufacturers take advantage of this, but American manufacturers do not and should not. Fines are heavy for false declarations.

American manufacturers could lower their prices if they would obtain a local warehouse for storage purposes and then ship in large quantities, preferably in chartered vessels. The freight rate from New York and the Gulf Coast is $0.255 per 100 lb., plus manifest fees of $0.15 per $1,000. In established lines the rates per ton are about $8. But chartered American bottoms can be had at about $7 a ton, it is reported. On the other hand, foreign lines compete with chartered vessels from the Atlantic seaboard and Gulf Coast at $4 per ton.

American manufacturers should effect every saving possible to get prices somewhere in line with those asked for foreign brands, and then should direct all efforts toward selling. More efficient sales methods, including an advertising campaign and the gradual education of local buyers by likable Spanish-speaking salesmen to the advantages of the bag container, are evidently the prerequisites of increased sales of American cement.

Little is known about the mineral deposits of Venezuela, but it does not appear likely that a cement plant there would be practical. American firms interested could doubtless buy the present plant.

This entire area has been surveyed by American interests with the idea of locating a site for a cement plant. Venezuela, although it is friendly to new industries and frequently permits the free importation of machinery and raw materials, has been passed by for other reasons.

The above information is a summary of special circular No. 7 on cement markets of the western hemisphere, issued by the Minerals division of the Bureau of Foreign and Domestic Commerce.

Grinding Plant Research

Part I—General Principles and Fundamentals of Tube Mill Grinding

By William Gilbert
Wh.Sc., M. Inst. C. E., London England

SINCE THE YEAR 1912 about 85% of the output of portland cement in Great Britain has been produced by two companies, namely, the Associated Portland Cement Manufacturers, Ltd., and the British Portland Cement Manufacturers, Ltd. These companies have 25 plants equipped with rotary kilns.

In 1913, chiefly owing to the influence of the late J. Bazley White, a joint research committee was formed to study some of the problems of cement manufacturers. It consisted of six managing directors, taken from the two companies; J. Bazley White was elected chairman and the writer was appointed chief engineer.

Scope of Research Work

The initial program evolved by the committee dealt mainly with the following items:

(a) The reduction of coal consumption in rotary kilns, as the yearly coal bill of the two companies at that date for rotary kilns and power was approximately £1,000,000.

(b) The investigation of the best dimensions for a rotary kiln, as regards its diameter and length, and the diameter and length of the clinkering zone.

(c) Improvements in grinding mills for coal and cement clinker.

In accordance with the above program the research technical staff visited each rotary kiln plant in succession and carried out exhaustive tests on the kilns, coal dryers, and grinding mills, under working conditions.

This proved quite successful in the case of kilns, and it was possible to effectively compare the working of widely different sizes when operating both on the wet and on the dry process.

As regards the grinding plant, it became evident after making a large number of tests that part of the information desired could be more easily obtained by the use of an experimental tube mill.

On the completion of the investigations of the research committee the directors were enabled to carry out a far-reaching scheme of reorganization, to which much of the present prosperity of the two companies is due. The grinding plant research led directly to the production of finely ground, rapid hardening cement. This research on grinding will be dealt with in this and the following articles.

The grinding mills investigated at the various plants were mainly: (a) Compound tube mills for grinding clinker; (b) Comminutors and tube mills for grinding coal; and (c) Compound tube mills for grinding coal.

Editor's Note

THIS is the first of a series of articles on cement mill grinding and describes the research work carried on in recent years by the joint research committee of the principal British cement manufacturers.

The present article outlines the data which were gathered and the methods of collecting them and also gives fundamental formulae and general principles relating to grinding in ball and tube mills.

Methods of determining the best speed for a tube mill and of calculating the required horse power are given.—The Editors.

Method of Collecting Data

To assist in the regular collection of the required data, notebooks with suitable headings were printed, one book being used for each grinding mill tested. Each book when completed than gave complete data on each compartment of each mill as follows:

Average speed of mill, rev. per min.
Measured brake horsepower.
Hp. factor, with material (Pm).
Hp. factor, without material (Po).
Dimensions inside of lining plates.
Type and condition of lining.
Weight, sizes and description of grinding bodies.
Depth of surface of charge below center line, inches.

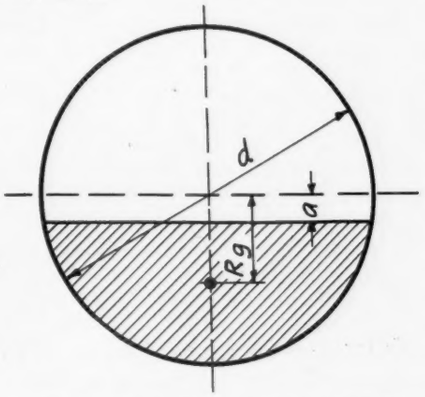


Fig. 1. Dimensions used in tube mill calculations

Total weight of material taken from compartment.
Weight per cu. ft. of material taken from compartment.
Size, area and condition of exit openings.
Description of feeder.
Size of openings and total screenings area of screens.
Volume inside of lining, cu. ft.
Volume of charge, per cent.
Value of *Rg*, the radius to the center of gravity of the charge, in inches.
Charge volume, in cu. ft.
Ratio of material volume to void volume, per cent.
Speed factor, *Sf*.
Description and initial moisture of material.
Method of measuring output and brake hp.
Method of sampling.
Duration of test.
Quantity of dry material ground per hour.
Sieve test of material before grinding.
Sieve test of material after grinding.
Power required per ton per hour, b.hp.

Sieve tests were made of the material in the mill when working at the normal rate of feed. This was done by stopping the mill, removing the manhole covers and taking samples of the material at regular intervals longitudinally from each compartment. These samples were tested to show the per cent. of residues on 50-, 76-, 100- and 180-mesh screens at different distances from the feed end plate.

Measurements were made of the average diameter and length of the mill inside the lining plates and if the lining was stepped or corrugated a drawing was made of it. The depth of the surface of the charge below the mill center line was taken in order that the charge volume could be calculated. The diaphragm plates and delivery ports were examined, and the area available for discharge through them was estimated, taking into account the extent to which the ports, or slots, were choked by pieces of iron or broken flints.

The mill was then emptied (whenever possible) and the grinding bodies from each compartment weighed and the various sizes noted. The total weight and the weight per cu. ft. of the material in each compartment was also taken.

The charge volume per cent. and the value of *Rg* were determined as follows from Figs. 1 and 2:

Measurements having been made of the diameter *d* and the distance *a*, Fig. 1, the ratio of the charge volume to the total mill volume (or the charge volume per cent.) and also the value of *Rg*, which is the dis-

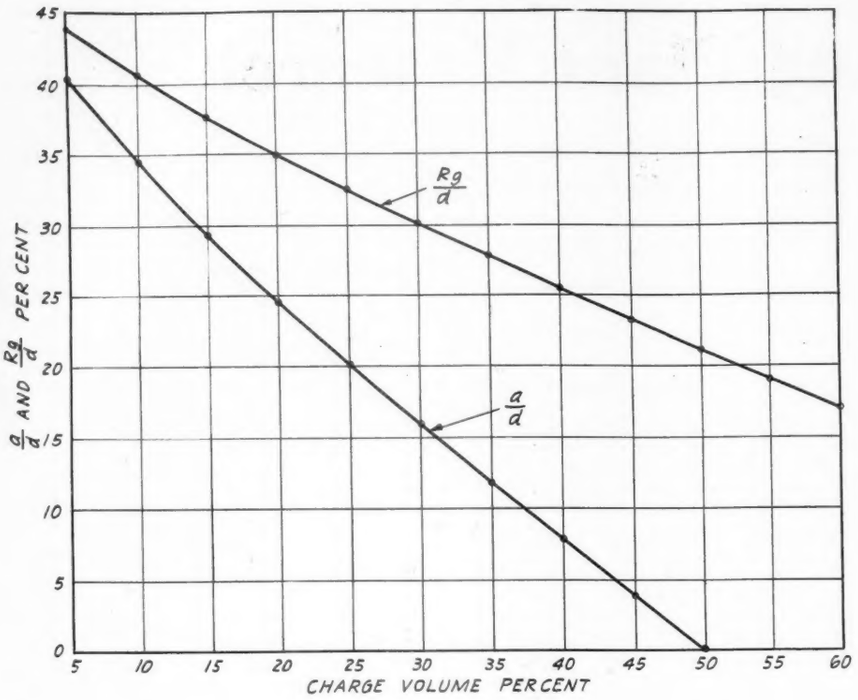


Fig. 2. Relation between $\frac{a}{d}$, $\frac{Rg}{d}$ and charge volume per cent.

tance from the horizontal center line of the mill to the center of gravity of the charge, when at rest, were determined by referring to the graphs in Fig. 2.

For example, if the value of the ratio $\frac{a}{d}$ in Fig. 1 is 5%, the charge volume (as read from the graph) is 43.6%, and the ratio $\frac{Rg}{d}$ is 24.0%.

The graphs in Fig. 2 were plotted from the calculations in Table I below.

TABLE I. RELATION BETWEEN $\frac{a}{d}$, $\frac{Rg}{d}$, AND CHARGE VOLUME PER CENT.

Charge volume per cent.	$\frac{a}{d}$ per cent.	$\frac{Rg}{d}$ per cent.
5	40.3	44.0
10	34.4	40.6
15	29.3	37.6
20	24.6	35.0
25	20.2	32.5
30	16.0	30.1
35	11.9	27.8
40	7.9	25.6
45	3.9	23.4
50	0.0	21.2
55	....	19.1
60	....	17.1

Volume of Voids

The ratio of the volume of the material being ground in each compartment, to the volume of the voids between the grinding bodies, was found to be important. The void volume is taken as the total space between the grinding bodies, as they would pack in the mill, if no material were present. It can be obtained by measuring the space actually occupied by the charge, after emptying out the material, and by deducting the space which would be required for a solid block of material of the same weight as the charge.

With *steel balls* the voids are found to average about 42.5% of the charge volume. Taking steel to weigh 490 lb. per cu. ft., it follows that the balls will weigh 0.575 × 490, or 282 lb. per cu. ft. of charge volume.

Hence, if W is the weight in lb. of the steel balls (without material) we then have (approximately):

$$\text{Charge volume} = \frac{W}{282} \text{ cu. ft.} \quad \text{F. (1)}$$

$$\text{Volume of voids} = \frac{W}{663} \text{ cu. ft.} \quad \text{F. (2)}$$

With *cylpebs* the voids are found to average 43% of the charge volume. Making the same calculations as before it is found that:

$$\text{Charge volume} = \frac{W}{279} \quad \text{F. (3)}$$

$$\text{Volume of voids} = \frac{W}{650} \quad \text{F (4)}$$

With *flint stones* an average value for the voids is 42% of the charge volume. Taking the solid flint to weigh 162 lb. per cu. ft., it follows that the flints will weigh 162 × 0.58 = 94 lb. per cu. ft. of charge volume. Hence, if W is the weight in lb. of the flint stones present, we have:

$$\text{Charge volume} = \frac{W}{94} \text{ cu. ft.} \quad \text{F (5)}$$

$$\text{Volume of voids} = \frac{W}{224} \text{ cu. ft.} \quad \text{F (6)}$$

Speed Factor

The speed factor, Sf, is used to determine a suitable speed for a tube mill, under specified working conditions, whatever its diameter may be. The formula now generally used for tube mill speed is:

$$N = \frac{Sf}{\sqrt{D-d}} \quad \text{F (7)}$$

Where N = revolutions per minute of the mill.
D = inside diameter of mill lining in *inches.*
d = average ball diameter in *inches.*
Sf = a number, which is adjusted by experiment to suit various operating conditions.

It may be useful to demonstrate that the above formula is rational. Let Fig. 3 represent the cross section of a tube mill, which is making N rev. per min. It is supposed to contain a single ball. In the position H, for instance, the ball would not be carried around on the mill lining, but in practice it is pushed forward by a series of balls in the rear. The support, thus given, is replaced in the figure by the bracket K.

Suppose B is the position in which the ball commences to roll off the bracket, in the next 1/5 second, to the scale on which the diagram is drawn, it will travel forward a distance BL due to the velocity acquired during rotation, and it will fall a distance LM due to the action of gravity, so that M is the position of the ball 1/5 second after it reaches the neutral point B. Similarly P and Q represent the positions of the ball after 2/5 and 3/5 second respectively.

Let ϕ be the angle which the radius OB makes with the horizontal diameter AOC, it is required to establish a relation between the diameter, and speed of the mill, and the angle ϕ.

The following notation is additional to that given above:

r = radius to center of ball, when in contact with the mill lining, in *feet.*
v = velocity of center of ball in ft. per sec.
w = weight of ball in lb.

Considering the ball in its neutral position B, the weight, which is represented by BG, may be resolved into two compartments, BE and BF, at right angles. The centrifugal force of the ball is represented by BD, and it is obvious that the ball will leave the mill lining as soon as BF is equal to BD.

Now $BF = BG \sin \phi = w \sin \phi$

also $BF = BD = \frac{wv^2}{gr}$

hence $\sin \phi = \frac{v^2}{gr}$ F (7) A.

In drawing Fig. 3, the angle ϕ was taken at 45 deg. and r = 3 ft., and the corresponding value of v was determined from F (7) A, thus:

$$v = \sqrt{gr \sin \phi} = \sqrt{32.2 \times 3 \times 0.7071} = 8.26 \text{ ft. per sec.}$$

Effect of Changing the Mill Diameter

Suppose the angle ϕ is kept at 45 deg., and some other value is used for r. Then if the

corresponding value of v is obtained from F (7) A, it will be found that the path of the ball, as cascaded, remains unaltered. If T is the point where the ball path crosses the horizontal diameter $A\,O\,C$, the ratio $\frac{O\,T}{r}$ will remain constant, whatever the value of r, provided that the angle ϕ is 45 deg., and the relation $sine\ \phi = \frac{v^2}{gr}$ is maintained. This may be demonstrated by writing down the equation for the path of the ball as cascaded.

In practice it is convenient to use the notation given above, F (7), and it follows that:

$$v = \frac{2\,\pi\,r\,N}{60} \text{ and } (D-d) = 24\,r.$$

Putting these values in F (7) A, we obtain:

$$sine\ \phi = \frac{\pi^2\,r\,N^2}{900\,g}$$

and

$$N^2 = \frac{900\,g\ sine\ \phi}{\pi^2\,r} = \frac{900 \times 24\,g\ sine\ \phi}{\pi^2\,(D-d)}$$

and

$$N = \frac{265.5\ \sqrt{sine\ \phi}}{\sqrt{D-d}}$$

The quantity $265.5\ \sqrt{sine\ \phi}$ is the speed factor, Sf, in F (7). If ϕ is taken at 45 deg., the corresponding expression for tube mill speed is $N = \frac{223}{\sqrt{D-d}}$.

In practice the value of the angle ϕ is not usually known, and values of Sf are determined by experiment to suit various operating conditions.

For example, when using an 18-in. diam. experimental mill, with a 30% charge of steel balls of 1-in. diam., it was found that a speed of 53 r.p.m. gave the best result, with smooth cast iron lining plates. In this case $(D-d) = 17$, and from F (7)

$$53 = \frac{Sf}{\sqrt{17}}, \text{ or } Sf = 53\sqrt{17} = 218.$$

It is assumed, therefore, that the speed required for an 84-in. diam. mill (using 1-in. diam. steel balls and a 30% charge) to reproduce similar cascading conditions would be

$$N = \frac{218}{\sqrt{84-1}} = 23.9 \text{ r.p.m.}$$

To show the variation in the path of a single ball, as cascaded in accordance with Fig. 3, when the speed factor changes, curves have been drawn for four usual values of Sf, as in Fig. 4. These curves are based on the data given in Table II following.

TABLE II. USING VALUES OF D = 73-IN. AND d = 1-IN.

Sf	$Sine\ \phi$	ϕ	N
175	0.4345	25 deg. 45 min.	20.63
200	0.5675	34 deg. 35 min.	23.57
220	0.6868	43 deg. 23 min.	25.93
240	0.8174	54 deg. 50 min.	28.29

Values of Sf, as given in column 1, were first chosen, and the corresponding values of $sine\ \phi$ in column 2 were calculated from the expression $Sf = 265.5\ \sqrt{sine\ \phi}$. The curves were then drawn as described, using in this instance $D = 73$ in. and $d = 1$ in. Corresponding values of N are given in column 4.

It will be remembered that, if the value of Sf remain constant, and F (7) is satisfied, the position and shape of the four curves in Fig. 4, in relation to the circle $A\,E\,C\,D$, will remain unaltered, whatever values are assigned to D and d.

The figures marked on the curves at various points give the times in tenths of a second from the neutral point.

The curve $A\,B\,C$ may be said to represent average conditions in a tube mill, as far as the cascading of the outer ring of balls is concerned. Taking the data of line 3 in Table II for this curve, the mill makes one revolution in 2.32 seconds, and the angle $A\,O\,C$ is 173½ deg., so that

Time of traversing arc $C\,D\,A$..... 1.12 sec.
Time of traversing path $A\,B\,C$..... 0.74 sec.

Time of cycle..... 1.86 sec.

It follows that each ball in the outer circle strikes $\frac{2.32}{1.86} = 1\frac{1}{4}$ blows for each revolution of the mill.

The curves in Fig. 4, which represent the cascading paths of a single ball, after it has been carried around, without slip, on the mill lining, are seen to be generally similar to those described by the outer ring of balls, in the glass model of a tube mill, when it is operated with various charges and at various speeds. It should be pointed out, however, that unless the percentage charge and other conditions are suitable, the curves described by the outer ring of balls in a tube mill may not coincide with those due to the corresponding speed factor in Fig. 4, but it is considered that the speed factor Sf, as used in F (7), will insure similar cascading conditions (and probably equal efficiency) in mills of various diameters, provided the percentage charge and the type of mill lining are similar. Some reservation must be made with regard to the actual ball diameter, and the quantity of material present in the mill in each case.

Horsepower Factors

The horsepower factors, Pm and Po, are derived from experiment and are used to calculate the b.h.p. required for a ball or tube mill when direct measurement cannot be made. For instance, the b.h.p. formula may

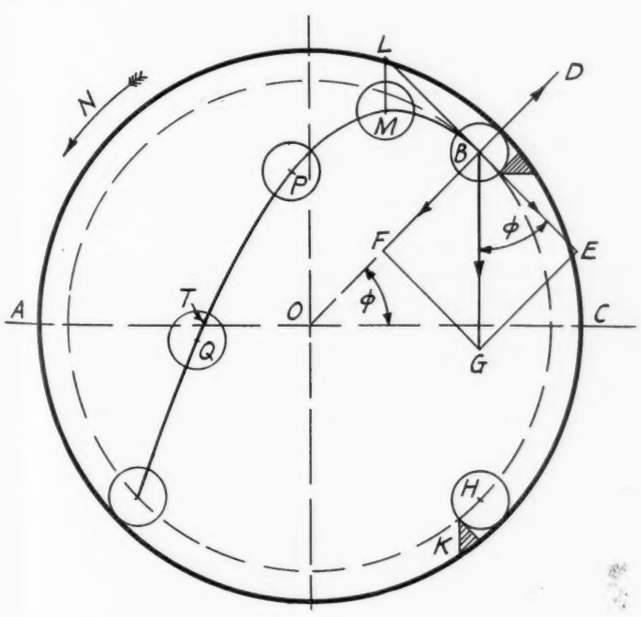


Fig. 3. Diagram for calculating speed factor of tube mill

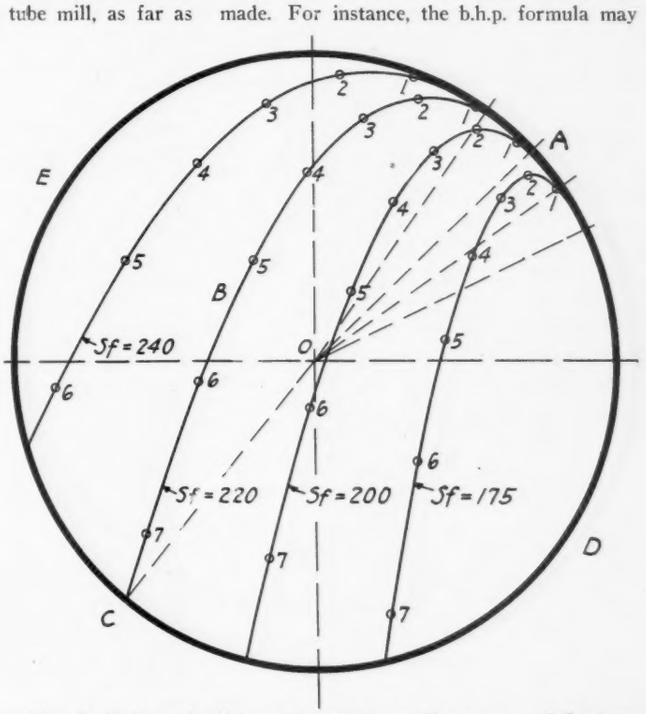


Fig. 4. Path of ball in tube mill for different speed factors

be applied to determine the proportion of power taken by each compartment of a compound tube mill, when the total power is known.

Let Fig. 5 represent the cross section of a tube mill which is running at somewhat less than normal speed, so that the charge $A\,B\,F$ has not yet opened out. Let C be the position of the center of gravity of the charge. The weight of the charge W is assumed to act along the vertical line $D\,C$. If the inclination of AB to the horizontal is θ, the angle EOC also equals θ. If W is measured in pounds and OD in feet, the work done per revolution against the overhanging weight of the charge is

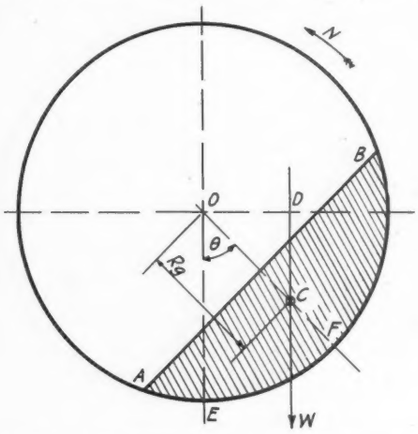


Fig. 5. Diagram for calculating hp. of tube mill

$$W \times 2\pi \times OD \text{ ft.-lb.}$$

Let the mill make N revolutions per minute, and noting that $OD = OC \sin \theta$ we obtain

$$\text{b.h.p.} = \frac{W \times 2\pi \times OC \sin \phi \times N}{33{,}000}$$

The angle ϕ is assumed provisionally at 50 deg., OC, the radius to the center of gravity of the charge is denoted by Rg, and it is measured in *inches*. If also W, the weight of the charge, is expressed in cwts.,* the formula reduces to:

$$\text{b.h.p.} = \frac{112\,W \times 2\pi \times Rg \times 0.766 \times N}{33{,}000 \times 12} = \frac{W \times N \times Rg}{735}$$

The figure 735, in the denominator, corresponds to the horsepower factor. In practice the formulae used are as follows:

$$\text{b.h.p.} = \frac{Wo \times N \times Rg}{Po} \quad \text{.....F (8)}$$

$$\text{b.h.p.} = \frac{Wm \times N \times Rg}{Pm} \quad \text{.....F (8) A}$$

Where

Wo = weight of charge in cwt., without material.

Wm = weight of charge in cwt., including material.

N = mill revolutions per minute.

Rg = radius to center of gravity, in inches, measured when the charge is at rest.

Po = horsepower factor for use with Wo.

Pm = horsepower factor for use with Wm.

When steel balls are used (not flints) the error made by neglecting the material weight is usually small. Average values, found by experiment, are:

For ball mills and communitors, $Po = 730$
For tube mills .....$Po = 707$

(To be continued)

*112 lb. based on English tons of 2240 lb.

Grade Crossings and Highway Intersections

BULLETIN 23 has been issued by the American Road Builders' Association. This bulletin discusses railroad grade crossings and highway intersections, and traffic. Information on highway capacity, parking, vehicle speed, and street widths is included. The bulletin is a report of that part of the transactions of the 1931 convention of the American Road Builders' Association dealing with these subjects.

State Exhibit of Sand and Gravel

OYSTERS and gravel are a curious combination, but the State of Louisiana places them on a par, apparently, in the exhibit of the state's natural resources at the capitol in Baton Rouge. Oyster *shells*, however, are in the same class in Louisiana with sand, gravel and limestone as aggregate and road-building material.

The accompanying view is interesting as proof that at least one state in the Union appreciates the value of its mineral resources even of such humble materials as sand and gravel.

Road Builders Present Radio Talks Advocating Road Activities

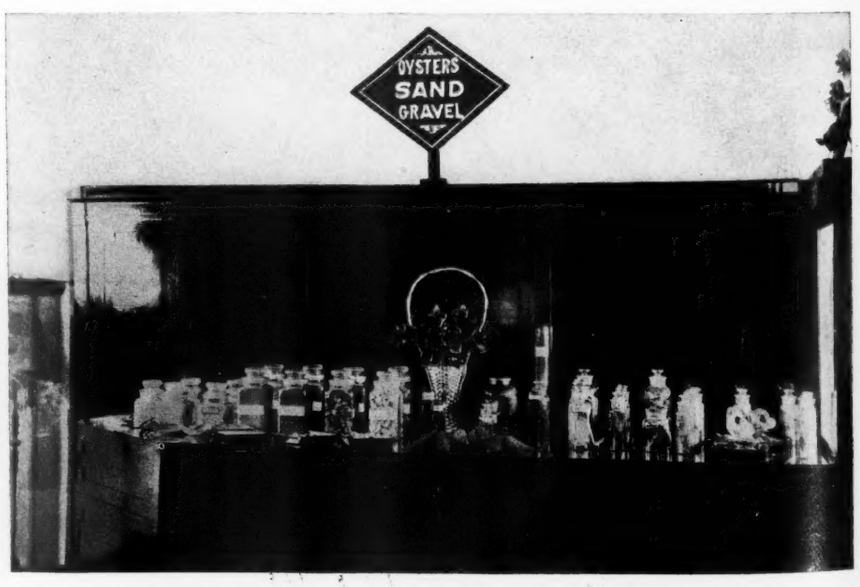
TWO RADIO TALKS advocating the expansion of highway programs will go on the air November 24 and December 8 over forty independent radio stations. These radio talks have been arranged by the American Road Builders' Association. The stations participating in this widespread broadcast for the benefit of highways cover the entire United States and Hawaii.

The subject of the talk on November 24 is to be "The Economy of Good Roads," and the subject of the December 8 talk is to be "Road Building for Unemployment Relief."

Highway activities are presented as the biggest stock company in the world for the public in the talk on the economy of good roads. "Economy of roads and streets is brought about by reducing losses. Economy is not merely a matter of reduced expenditures. On the contrary, reduced expenditures means increasing the losses under present conditions of lack of safety and costly congestion on the highways," state the speakers.

"Road building for unemployment relief has been tested during the past summer," says the third talk, "and as in previous tests it has been found most efficient in putting men to work promptly. All types of men from industries that are temporarily inactive are absorbed readily in road building. More than a million men were employed directly on road building during the past summer, and two million other men were kept busy furnishing supplies, materials, and equipment to road workers."

Speakers include outstanding public officials engaged in city, county and state road and street activities.



Louisiana exhibit of oyster shells, sand, gravel and stone

Mining and Crushing Methods and Costs at Tiffin Limestone Quarry of Thurber Earthen Products Co., Fort Worth, Tex.*

By Dayton C. Bolin†

THE activity in the Ranger oil fields of Eastland and Stephens counties, Texas, during 1918-19 created a demand for large quantities of crushed stone for highway construction, and at the same time it was predicted that the railroad would soon require ballast as part of an extension program to take care of the increase in business due to the oil discovery.

Some of the directors of the Texas Pacific Coal and Oil Co., the discoverer of the new oil field, saw attractive possibilities in the crushed-stone business, provided suitable rock could be obtained locally. Limestone was known to occur throughout the locality and one or two small quarries were operating, but no comprehensive investigation of limestone resources had been made. Such a survey was undertaken and a suitable ledge of limestone was found near Ranger at a place known as Bull Creek but later called Tiffin when it became a station on the Texas and Pacific railway. A company known as the Thurber Earthen Products Co. was organized to produce and sell crushed limestone.

Early in 1919 the building of a modern crushing plant and the opening of the quarry were begun. The plant started operation in September, 1920. The railroads soon became active buyers of the crushed stone and the anticipated output was readily realized. Numerous improvements in plant and organization have been made from time to time.

Geology

The rock quarried at Tiffin is a limestone containing about 52% lime (CaO), largely in the form of carbonate. The overburden, which is a clayey soil varying in color from a light yellow to reddish or black, averages not more than a foot to 16 in. in depth over the whole quarry area. The limestone varies from 20 to 25 ft. in thickness, the average being about 23 ft. Below the limestone is a layer of shale 12 to 18 ft. thick. The shale is supposed to cap another stratum of limestone, but there is no evidence at hand to support this supposition. The formation is fairly uniform throughout the quarry area.

Throughout the quarry joints or seams divide the limestone into blocks with overburden or clay filling the crevices between them. In some instances these joints extend down to the shale some 25 ft. below; in other cases they run laterally, are irregular and broken and do not extend so far. Their strike has a definite tendency to run south 30 deg. west with considerable cross jointing at about right angles.

Physical Characteristics

The limestone varies in color from a dark cream to a slate gray. This variation occurs uniformly at certain locations throughout the quarry, but the color of the stone has no material influence on its composition.

Physical tests of the stone made by the University of Texas gave results as follows:

Specific gravity	2.66	
Weight in lb. per cu. ft.	166.	
Per cent. wear (Deval test)	2.76	
French coefficient of wear	14.50	(high)
Coefficient of hardness (Dorry test)	14.10	
Toughness (page impact test)	7.50	(low)
Cementing value	40.0	(good)
Crushing strength, on 2-in. cube, lb. per sq. in.	16,650	(high)

Chemical analyses of the quarry materials are as follows:

	Stone	Shale	Overburden
Silica (SiO_2)	2.34	80.40	54.70
Iron oxide and alumina (Fe_2O_3 and Al_2O_3)	2.06	14.20	15.50
Lime (CaO)	52.80	0.67	3.90
Magnesia (MgO)	0.50	0.62	2.80
Sulphate (SO_4)	0.15	0.63	3.20

Method of Exploration

The property was tested by diamond-drill holes through the limestone at intervals of about every 100 ft. Because of the destruction of the main office by fire many of the old drilling records are not available, but the area, formation and content of the deposit have been well surveyed and the latter is sufficient for a considerable number of years. Cost figures for exploration are not available.

Sampling and Estimation of Tonnages

No routine sampling is carried on, and physical and chemical analyses of the limestone are made only occasionally. Ten sizes of stone are produced ranging from 3½ in. down to 3/16 in. in maximum diameter. Screen tests of the various sizes are made in the plant and by inspectors representing large buyers. The estimated tonnage unquarried is about 8,000,000 tons, which will suffice for 25 years at the present rate of production.

Mining Methods

The overburden is removed by contract in wagons and motor truck at 40 c. per sq. yd. of surface stripped. Due to the shallow depth of the overburden this has proved to be the least expensive method of stripping.

The stone is quarried by well drilling, blasting with dynamite and loading on 6-yd. dump cars with steam shovels. It is then hauled by two 18-ton locomotives to the primary crusher. A general plan of the quarry is shown in Fig. 1.

Stripping

The overburden is hauled to a valley about one-half mile away and dumped. Contracts are given for removing a specified amount and the contractor may use his judgment in its removal so long as quarrying operations are not inconvenienced. The contractor usually completes the job as soon as possible and moves to other work until he is needed again. The overburden has no commercial value. It is dumped into the valley with the idea of eventually damming it and furnishing a reservoir for water to be used in and around the quarry.

Well Drilling

Six-inch holes are drilled about 23 ft. deep with two portable Loomis Clipper churn-type well-drilling machines. Power is fur-

Editors' Note

THIS paper is one of a series being prepared by the U. S. Bureau of Mines describing quarrying methods and costs at stone quarries throughout the United States.

These papers are designed to disseminate technical information regarding the methods used, as well as present costs on such a basis that they are comparable to those of other producers. The cost tabulations represent direct operating expenditures only and not total production costs.

In this paper very complete information is given on a typical stone crushing plant and quarry.— The Editors.

*Abstracted from U. S. Bureau of Mines Information Circular 6531.

†One of the consulting engineers, U. S. Bureau of Mines, and chemical engineer, Texas Pacific Coal and Oil Co., Fort Worth, Tex. The author wishes to acknowledge the assistance of J. R. Thoenen, mining engineer, United States Bureau of Mines; E. R. Lederer, vice-president in charge of the company's operations; E. T. Eubank, superintendent of the quarry; J. A. Hodges, quarry foreman, and J. von Carlowitz, chief clerk.

nished by a 50-hp., 4-cyl. Buda gasoline motor. The drilling speed is about 8 ft. per hour per machine. The holes are spaced 10 ft. apart and 10 ft. from the bench face. About 35 holes are shot simultaneously, and as a rule three-quarters of the charge is at the bottom of the hole, the other quarter being placed further up. The position of the charge depends on the prevalence of the joints and the uniformity of the rock.

Blasting Well-Drill Holes

Sixty per cent. quarry gelatin in 5 by 12 in. sticks is used in blasting, with No. 6 detonators and plain and single countered cordeau. The cordeau is lowered with the first cartridge, the remaining cartridges are tamped in and the hole is filled with limestone screenings. About a foot of cordeau is left extending above ground to tie into the lead wire for firing.

One crew consisting of four men—powder foreman, driller and two helpers—load, tamp and fire. The time required for loading 35 holes is approximately 4 hr. Each hole takes roughly a 75-lb. charge of explosive.

The fragmentation obtained varies from pieces of rock less than 1-in. in maximum diameter to 6 or 8 ft. boulders. The use of a large primary crusher reduces secondary blasting to a minimum.

Secondary Blasting

The amount of secondary blasting depends to a great extent on what part of the quarry is being worked—in other words, on the extent to which joints prevail and the angle at which they approach the bench. From 10 to 20% of the stone requires secondary blasting.

Blockholing is the method used in secondary blasting, although mud capping is resorted to at times. One and one-quarter inch holes are drilled with an Ingersoll-Rand, style 430, butterfly jackhammer. Forty per cent. N. G. dynamite in 1⅛ by 8 in. sticks and safety fuse with a burning speed of 1 f.p.m. are employed. One hole is usually sufficient for each boulder. The secondary blasting is done by three men from the shovel crew as the work becomes necessary.

The quantity of explosive used for primary blasting averages about 75% of the total, which is approximately 1/5-lb., costing 2½ c. per ton of stone broken.

Loading Stone

Two steam, railway-type shovels equipped with 2 and 2½ yd. dippers are used for loading the stone. These shovels are operated by six men to the shovel, the crew consisting of an engineer, craneman, fireman and three pitmen. The three pitmen act as secondary-blasting men and are supervised by the engineer or quarry foreman.

The selection of steam shovels was primarily due to the lack of other power facilities at the time the plant was erected. It is recognized that electrical equipment might be more economical, but a replacement is not deemed advisable at this time.

The stone and the waste at the quarry are all loaded together, the separation being made in the plant. The shovels load five cars of 7-tons capacity each in about seven minutes, or about 2000 tons of rock per day for the two shovels. The shovels are capable of loading 3000 tons, but the plant will not take care of this quantity.

Transportation to Crusher

A sketch of the quarry cars in use is shown in Fig. 2. The transportation of the stone from the quarry is taken care of by two Porter, 18-ton, saddle-type, standard-gage steam locomotives with 4-wheel drive. These locomotives each pull five flat-bottom cars with upright sides and having a capacity of 7 tons each up a 3% grade to the crusher and return them to the quarry over the same track. The haul may vary from ¼ to 1 mile, depending on where the shovels are working. The cars, which are Western Wheel and Scraper type and have bodies lined with steel plate, are side dumped to the crusher.

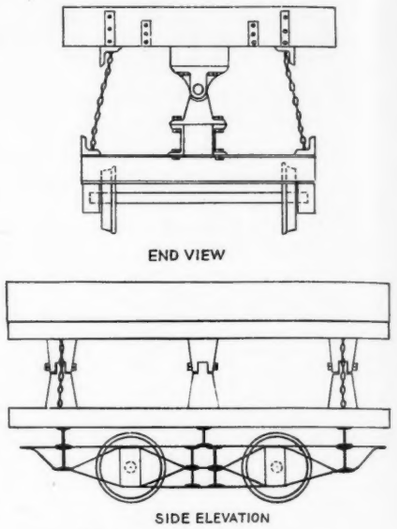


Fig. 2. Quarry dump car

The permanent tracks are of 75-lb. rails and the movable tracks are of 65-lb. steel. The various tracks and sidings on the property are shown in Fig. 1.

Each locomotive has one operator or engineer who does all the work—firing, taking water, lubricating cars, etc. The fuel used is a topped crude oil purchased from a nearby refinery in tanks cars.

The quarry has natural drainage. The water flows from the quarry to a stream which is well below the floor level and within 50 ft. of the quarry's edge.

Crushing Plant

Plans and details of the crushing plant are shown in Figs. 3 and 4 and a flow sheet of the plant is shown in Fig. 5.

The loaded quarry cars are dumped into the primary crusher by an 8-in. by 6-ft. Curtis airhoist which exerts a 5-ton lift with 80 lb. air pressure.

The cars are spotted above the crusher by the locomotives and are lowered to the crusher for dumping by a cable attached to the upper car and running off a drum controlled by an air-pressure clutch. The cable is rewound on the drum by a 50-hp. squirrel-cage motor. This mechanism was made locally and although not of the best it answers its purpose satisfactorily.

After being discharged into the primary

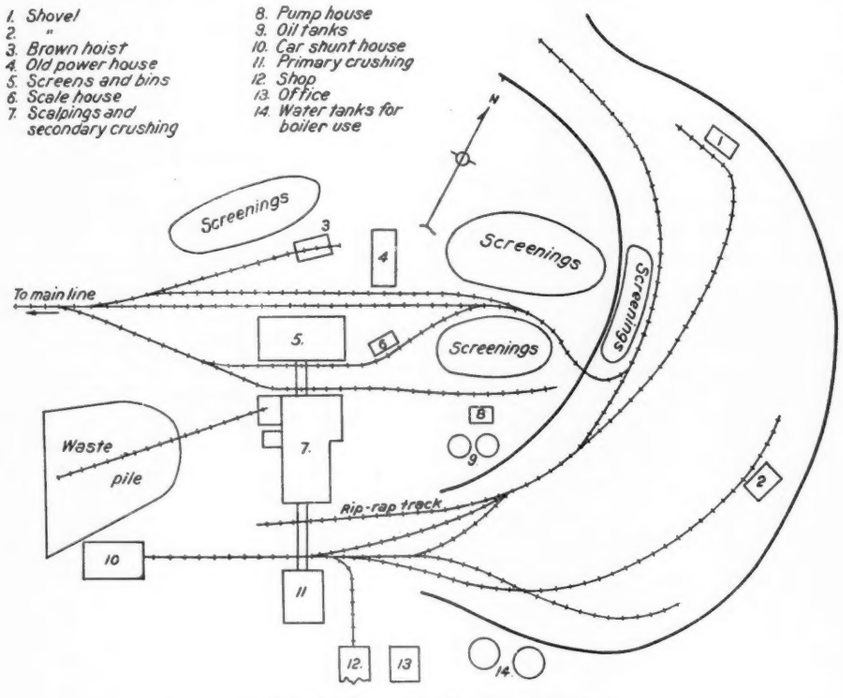


Fig. 1. General plan of quarry

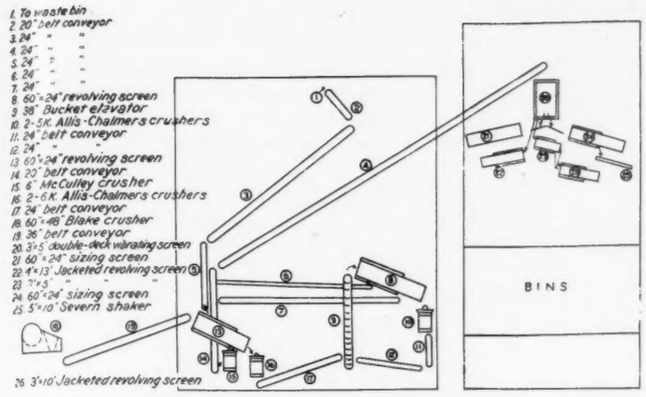

1. To waste bin
2. 20" belt conveyor
3. 24" " "
4. 24" " "
5. 24" " "
6. 24" " "
7. 24" " "
8. 60"×24" revolving screen
9. 38" Bucket elevator
10. 2-5K. Allis-Chalmers crushers
11. 24" belt conveyor
12. 24" " "
13. 60"×24" revolving screen
14. 20" belt conveyor
15. 6" McCulley crusher
16. 2-6K. Allis-Chalmers crushers
17. 24" belt conveyor
18. 60"×48" Blake crusher
19. 36" belt conveyor
20. 3'×5' double-deck vibrating screen
21. 60"×24" sizing screen
22. 4'×13' Jacketed revolving screen
23. 3'×5' " " "
24. 60"×24" sizing screen
25. 5'×10' Severn shaker
26. 3'×10' Jacketed revolving screen
BINS

Fig. 3. Elevation of crushing plant

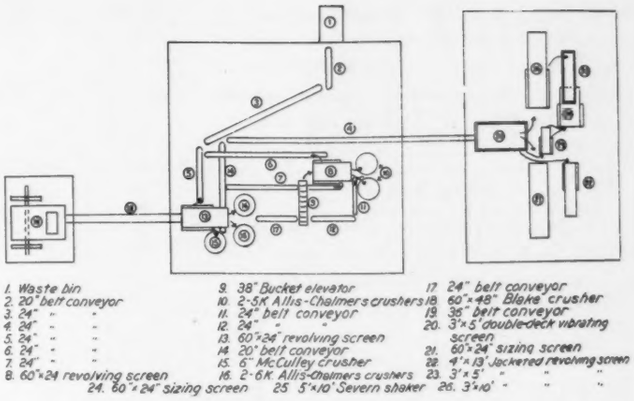

1. Waste bin
2. 20" belt conveyor
3. 24" " "
4. 24" " "
5. 24" " "
6. 24" " "
7. 24" " "
8. 60"×24 revolving screen
9. 38" Bucket elevator
10. 2-5K Allis-Chalmers crushers
11. 24" belt conveyor
12. 24" " "
13. 60"×24" revolving screen
14. 20" belt conveyor
15. 6" McCulley crusher
16. 2-6K Allis-Chalmers crushers
17. 24" belt conveyor
18. 60"×48" Blake crusher
19. 36" belt conveyor
20. 3'×5' double-deck vibrating screen
21. 60"×24" sizing screen
22. 4'×13' Jacketed revolving screen
23. 3'×5' " " "
24. 60"×24" sizing screen
25. 5'×10' Severn shaker
26. 3'×10' " " "

Fig. 4. Plan of crushing plant

crusher the stone takes the following route:

1. 60 by 48 in. Blake jaw crusher.
2. 36-in. conveyor belt.
3. 60-in. by 24-ft. Allis-Chalmers revolving scalping screen.
4. 24-in. conveyor belt.
5. 2 No. 6K Allis-Chalmers gyratory crushers.
6. 6-in. McCully gyratory crusher.
7. 20-in. conveyor belt.
8. 24-in. conveyor belt.
9. 38-in. bucket elevator.
10. 60-in. by 24-ft. Allis-Chalmers revolving scalping screen.
11. 2 No. 5K Allis-Chalmers gyratory crushers.
12. 24-in. conveyor belt.
13. 24-in. conveyor belt.
14. 36-in. by 5-ft. vibrating screen.
15. 2 60-in. by 24-ft. sizing screens.
16. Screens for sizing small materials.
17. Storage bins.

Primary Crusher

The primary breaker is a 60 by 48 in. Blake jaw crusher which is set with a discharge opening of 8 in. and is driven by a 200-hp. induction motor. Electric power is furnished from the Eastland plant of the Texas Electric Service Corp.

The discharge from the primary crusher is carried by a 36-in. rubber-covered conveyor belt a distance of 142 ft. to the first revolving scalping screen. The conveyor is driven by belt from a main line shaft which serves other conveyors, revolving screens and crushers and which is driven by a 150-hp. induction motor.

The scalping screen has round perforations from 3½ to 2 in. in diam. and is jacketed two-thirds of its length with a ⅝-in. square-mesh screen. Material that passes the jacket goes to waste and that retained on the ⅝-in. screen goes to the 6-in. McCully crusher with the coarse material from the screen. During wet weather, however, all stone through the 2-in. screen goes to waste to eliminate the dirt, clay, etc. The screen is driven from the same line shaft that drives the 36-in. conveyor from the primary crusher.

A 24-in. rubber-belt conveyor takes the waste material from the first scalping screen and also the ⅜-in. screenings from the second scalping screen when there is no demand for this class of material. The ⅜-in. screenings when salable are stored in bins.

This conveyor is 160 ft. long and is belt-driven by a 10-hp. induction motor.

Two No. 6K Allis-Chalmers gyratory crushers are fed by gravity from the revolving screen. Each crusher is set for an opening of 3½ in. and the stone is delivered directly to a 24-in. belt conveyor. The drive is from the main line shaft by belt.

The 6-in. McCully crusher is fed from the scalper, receiving the 3½ to 2 in. oversize. The discharge opening is 2¼ in. and the crusher is driven by belt from the main line shaft.

The discharge from the McCully 6-in. crusher goes to a 20-in. rubber-belt conveyor 40 ft. long and is discharged onto the 24-in. conveyor carrying the crushed stone to the sizing screens. It is driven by a 7½-hp. Allis-Chalmers motor.

The discharge from the 6K Allis-Chalmers crushers is handled by a 24-in. rubber-belt conveyor, 20 ft. long, driven by a 7½-hp. motor. It discharges to the 38-in. bucket elevator which is 40 ft. long and carries up to the second scalping screen. It is belt-driven from the main line shaft through reduction gears to obtain the desired speed.

Second Scalping Screen

This is a 60-in. by 24-ft. Allis-Chalmers revolving screen having five sections — four sections with 2-in. perforations and one section with 2½-in. perforations. The four sections with 2-in. holes are jacketed with ⅝-in. mesh screen. The screenings go to either the waste bin or the screenings bin, depending on market conditions. The material retained on the ⅝-in. screen goes to the sizing screen via the 24-in. conveyor along with other material for the same destination. The stone retained on the scalping screen is discharged by gravity directly into two 5K Allis-Chalmers crushers. The scalping screen is powered from the main-line shaft.

The two 5K Allis-Chalmers gyratory crushers that receive the stone from the second scalping screen have discharge openings set at 2¼ in. The discharge from the crushers is returned to the 38-in. bucket elevator by two 24-in. conveyors and thence to the second scalping screen, thus forming a closed circuit. Power for these crushers is supplied from the main-line shaft by belt drive and the 24-in. conveyors are driven by a 7½-hp. motor.

The screenings from the second scalping screen are handled by a 24-in. belt conveyor

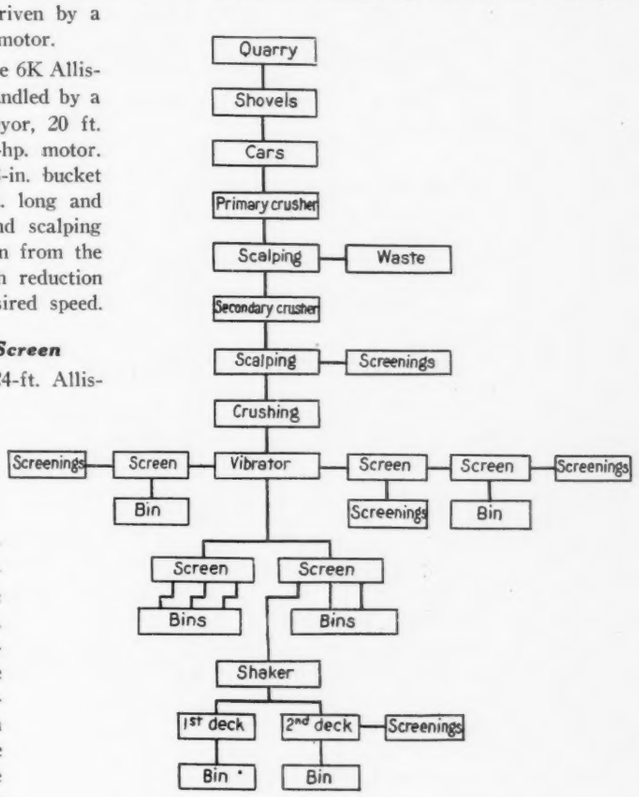


Fig. 5. Flow sheet

60 ft. long that can discharge all or part of the material to either the conveyor going to the sizing screen or to the waste bin, depending on the demand for material of this size. The conveyor is driven by a 10-hp. motor.

Sizing Screens

The crushed material for the sizing screens is delivered by a 24-in. conveyor to a 3 by 5 ft. Link-Belt, double-deck, vibrating screen, having an upper deck of 7/8-in. square mesh and a lower deck of 3/8-in. mesh screen and belt-driven by a 7½-in. motor. Each of the two smaller sizes goes to a smaller revolving screen for further separation and cleaning from dust. The oversize on the 7/8-in. screen is discharged, split, and fed to two revolving sizing screens.

These are 60-in. by 24-ft. Allis-Chalmers screens with six 4-ft. sections of perforations varying from 1 to 2 in., as shown in Fig. 5. The sized stone is chuted to storage bins. These two sizing screens, together with three small revolving screens in the screen room, are driven from a line shaft by a 100-hp. induction motor. The screen sections and general arrangement of the screens are shown in detail in Fig. 6.

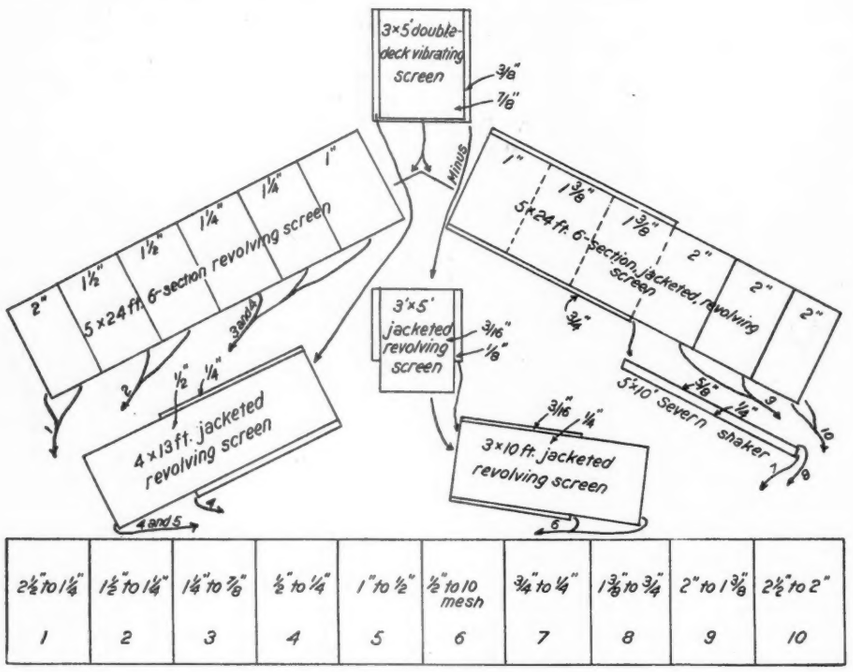


Fig. 6. Sizing screens and bin details

Tonnages Handled by Screens

The 5 ft. by 7 ft. Severn screen is driven by a 10-hp. motor. The undersize from the ¼-in. deck goes to the dust bin. When specifications do not exact a thorough separation the various sizes from 1⅜-in. down to ¼-in. can be and sometimes are delivered to the same bin and considered as minus 1⅜ plus ¼-in. commercial stone.

APPROXIMATE TONNAGE PASSING EACH SCREEN, BY SIZES

	Tons per hour
First scalping screen—Minus 5/8-in.	30
Plus 5/8-in.	170
Total	200
Second scalping screen—Minus 3/8-in.	12
Plus 3/8-in.	158
Total	170
Vibrating screen—Upper deck: Minus 7/8-in.	20
Plus 7/8-in.	138
Total	158
Lower deck: Minus 3/8-in.	4
Plus 3/8-in.	16
Total	20
3 by 5 ft. revolving screen—Inner jacket: Minus 3/16-in.	2
Plus 3/16-in.	2
Total	4
Outer jacket: Minus 1/8-in.	1
Plus 1/8-in.	1
Total	2
3 by 10 ft. revolving screen—Inner Jacket: Minus ¼-in.	2
Plus ¼-in.	1
Total	3
Outer jacket: Minus 3/16-in.	1
Plus 3/16-in.	1
Total	2
4 by 13 ft. revolving screen—Inner jacket: Minus ½-in.	9
Plus ½-in.	7
Total	16
Outer jacket: Minus ¼-in.	4
Plus ¼-in.	5
Total	9
West 60-in. by 24-ft. revolving screen—Section 6 Minus 2½ plus 1½ in.	45
Sections 4 and 5: Minus 1½ plus 1 in	8
Sections 1, 2 and 3: Minus 1¼ plus 7/8 in.	17
Total	70
East 60-in. by 24-ft. revolving screen—Section 6: Minus 2½ plus 2 in.	32
Sections 4 and 5: Minus 2 plus 1⅜ in.	11
Sections 1, 2 and 3: Minus 1⅜ plus ¾ in.	15
Through ¾-in. jacket: Minus ¾-in.	10
Total	68
5 by 10 ft. shaking screen—Upper deck: Minus 5/8-in.	50
Plus 5/8-in.	50
Total	100
Lower deck: Minus ¼-in.	20
Plus ¼-in.	30
Total	50

The output consists of 10 sizes of material, as follows:

AMOUNT OF EACH SIZE PRODUCED

Product	Tons per 2000 tons stone	% of total
Minus 2½ plus 2 in.	770	38.5
Minus 2 plus 1⅜ in.	110	5.5
Minus 1½ plus 1 in.	80	4.0
Minus 1⅜ plus ¾ in.	150	7.5
Minus 1¼ plus 1 in.	170	8.5
Minus 1 plus ½ in.	70	3.5
Minus ¾ plus 5/8 in.	50	2.5
Minus ¾ plus ¼ in.	50	2.5
Minus 5/8 plus ¼ in.	30	1.5
Minus ½ plus 10-mesh	20	1.0
Commercial stone	1500	75.0
Waste	500	25.0
Total	2000	100.0

The bins are so arranged that the various materials may be mixed to accommodate demands for any specific size or range of sizes. Their contents can be drawn off separately by gates leading directly through chutes into cars. One man handles all the loading. The buildings are wooden frame with corrugated-iron sides and roof and on concrete foundations.

All waste is stored or dumped near the plant and is transported from the waste bins by rail in 2-yd., side-dump, steel cars. The haulage is done by an electric mining-hoist engine using a ¾-in. steel cable and a 100-hp. induction motor. Disposal of the waste screenings is also accomplished by means of a Brown-hoist locomotive crane. The material is loaded into regular railway-type cars from the bin and hauled to the point of unloading, where the Brown-hoist discharges the cars. The Brown-hoist carries a 1-yd. clamshell bucket and a 40-ft. boom. About 40 min. is required to unload a 50-ton car.

The general yard haulage is done by a 50-ton, saddle-type, 4-wheel drive American locomotive. The main duty of this locomotive is to haul the empty loaded cars to and from the main-line switch of the Texas and Pacific railroad at Tiffin, which is about ¾ mile distant. All hauling of screenings,

waste, riprap, etc., is also done by this locomotive. The loading yard has accommodations for the storage of 65 cars. There are approximately seven miles of track inside the quarry. The stone is weighed on a 150-ton Howe scale by the loader, who is a certified weigher. The car loader has an assistant who cleans and patches the cars to prevent waste in transit.

Miscellaneous

Compressed air for secondary drilling, drill sharpening, lowering and spotting quarry dump cars at the primary crusher, blowing and cleaning motors, pneumatic tools, etc., is obtained from a 10- by 10-in. Ingersoll-Rand compressor, making 275 r.p.m. and delivering air at 100-lb. pressure. In addition there are two 11- by 12-in. locomotive-type Westinghouse air-brake compressors mounted on the two steam shovels, which supply air for secondary drilling.

All the shop work is done in one building. Most parts are ordered in the rough and machined down to requirements.

Due to the rather isolated location of the quarry the well-equipped shop pays for itself.

The shop personnel consists of 1 foreman, 1 machinist, 1 blacksmith, 1 blacksmith's helper, 1 welder and 1 carpenter.

Since 1923 all power has been purchased from the Texas Electric Service Co. Power costs are distributed on the basis of rated horsepower and the hours worked by each motor.

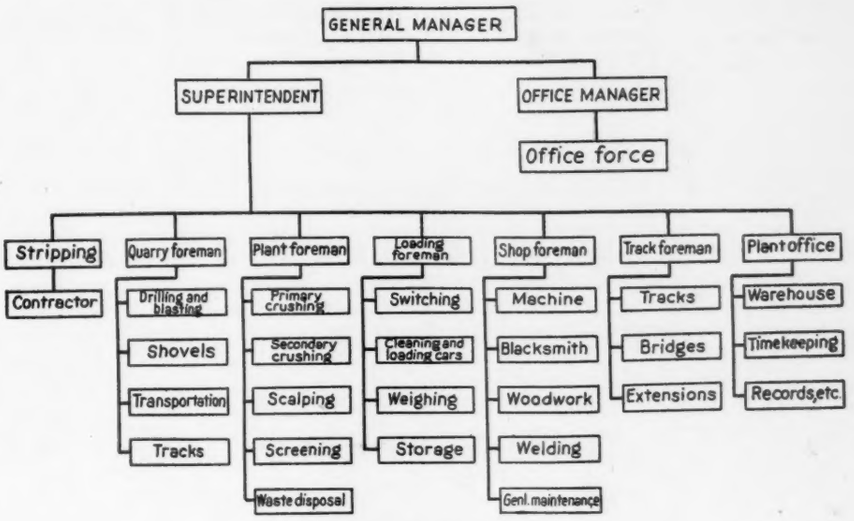


Fig. 7. Organization chart

General

In figuring costs, superintendence includes the salary of the superintendent, quarry foreman, night watchman, clerks, general supervision and office work and all expenses in connection with the safety program.

The office and warehouse expense includes the cost of materials, supplies and maintenance of equipment for this particular department.

The general-buildings expense includes the cost of upkeep of camp dwellings, dynamite house, water and oil storage tanks, office and warehouse buildings, oil-and-paint storage house, change house, etc.

Miscellaneous expense includes all general expenses that cannot be definitely allocated, such as that for yard cleaning, janitor work, etc.

Group Life Insurance

After an employe has been with the company for one month he is eligible for a group life policy, the principal of which increases with length of service as follows:

Length of employment	Insurance
1 to 6 months	$200
6 months to 1 year	300
1 to 1½ years	400
1½ to 2 years	500
2 to 2½ years	600
2½ to 3 years	700

and so on up to a maximum of $1000. The premiums are paid by the company.

All employes are paid twice a month on an hourly basis; the superintendent, quarry foreman, watchman and clerk are paid a monthly salary. During a year the quarry is operated about 275 days of 10 hours each, or an average of 53 hours per week. The average hourly wage is 47 c.

The only contract work is the removal of

SUMMARY OF COSTS—1929

Total overburden stripped	7,700 cu. yd.		
Total stone mined	443,325 tons		
Crushed and sold	308,571 tons		
Waste, screenings, and loss	134,754 tons		
		Per-ton costs	
	Amount	Based on 443,325 tons mined	Based on 308,571 tons sold
Stripping (contract) and rental of land	$ 11,924.20	$0.0269	$0.0387
Drilling and blasting*	27,063.50	0.0610	0.0877
Shovel and loading†	39,717.20	0.0896	0.1287
Total cost of rock loaded in quarry cars	$ 78,704.90	$0.1775	$0.2551
Transportation to jaw crusher‡	16,484.82	0.0372	0.0534
Jaw-crusher expense¶	9,797.20	0.0221	0.0318
Secondary crushing and screening	27,312.37	0.0616	0.0885
Waste disposal	4,611.22	0.0104	0.0149
Loading and switching	14,497.49	0.0327	0.0470
Superintendence and general plant expense	13,096.34	0.0295	0.0424
Total operating costs	$164,504.34	$0.3710	$0.5331

*Includes all expenditures for primary and secondary drilling and blasting before shovel operations.
†Includes cost of some explosives used during shovel operations.
‡Includes maintenance of locomotive, cars and tracks.
¶Includes cost of some pop shots at crusher.

SUMMARY OF COSTS PER TON—1929

Total rock handled, 443,325 tons. Total rock recovered and sold, 308,571 tons

Operating account	Labor		Fuel and gas		Water		Lubricants and supplies		Maintenance		Explosives		Power		Total	
	Per ton mined	Per ton sold	Per ton mined	Per ton sold	Per ton mined	Per ton sold	Per ton mined	Per ton sold	Per ton mined	Per ton sold	Per ton mined	Per ton sold	Per ton mined	Per ton sold	Per ton mined	Per ton sold
Stripping by contract and rental	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	$0.0269	$0.0387
Drilling and blasting	$0.0132	$0.0190	$0.0043	$0.0061	$0.0002	$0.0004	$0.0002	$0.0003	$0.0056	$0.0080	$0.0375	$0.0539	.....	.....	.0610	.0877
Shovel and loading	.0303	.0435	.0115	.0164	.0015	.0021	.0022	.0032	.0329	.0473	.0103	.0148	$0.0009	$0.0014	.0896	.1287
Cost of rock f.o.b. quarry cars	.0435	.0625	.0158	.0225	.0017	.0025	.0024	.0035	.0385	.0553	.0478	.0687	.0009	.0014	.1775	.2551
Transportation	.0088	.0126	.0091	.0131	.0008	.0011	.0005	.0008	.0180	.0258	.....	.....	.....	.....	.0372	.0534
Jaw crusher	.0062	.0089	.....	.....	.0003	.0004	.0016	.0023	.0090	.0129	.0011	.0016	.0039	.0057	.0221	.0318
Secondary crushing and screening	.0202	.0290	.....	.....	.....	.....	.0022	.0032	.0173	.0248	.....	.....	.0219	.0315	.0616	.0885
Waste disposal	.0052	.0074	.0011	.0016	.....	.....	.0001	.0002	.0021	.0030	.....	.....	.0019	.0027	.0104	.0149
Loading and switching	.0127	.0183	.0062	.0089	.0008	.0011	.0004	.0006	.0126	.0181	.....	.....	.....	.....	.0327	.0470
Superintendence and plant miscellaneous	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0295	.0424
Total	$0.0966	$0.1387	$0.0322	$0.0461	$0.0036	$0.0051	$0.0072	$0.0106	$0.0975	$0.1399	$0.0489	$0.0703	$0.0286	$0.0413	$0.3710	$0.5331

overburden, as previously mentioned. No bonus system is in force.

Safety Methods

Steps were taken in 1926 to inaugurate a safety program. A general safety committee, consisting of senior members of the company, and a safety council committee at the plant, including the superintendent, quarry foreman and the foreman of each department, were organized. Meetings are held monthly, at which time reports are read and discussed and means of preventing accidents are considered.

Before a new employe is placed on the payroll he is examined by the company's physician and directed to read a pamphlet of instructions on safety methods. On the employe's application blank he is required to give in detail his past record for several years. After employment he is especially coached in his duties with a view toward safety and he is supposed to attend safety meetings.

The frequency rates of accidents for the past three years are:

1928	78.5
1929	56.0
1930	32.0

Organization

The superintendent is in charge of all operations and he appoints foremen and other department heads after consultation with the vice-president. The superintendent is aided by an assistant, who is the quarry foreman. Fig. 7 shows the quarry organization chart.

The personnel of the plant is as follows:

	Average number of men
Stripping (by contract)	4
Drilling	3
Secondary drilling	1
Loading to quarry cars	6
Shovel pitmen	5
Transporting to crusher	3
Primary crushing	3
Scalping and secondary crushing	5
Screening	1
Waste disposal	2
Main railroad (track men)	5
Loading crew	4
Brown hoist	1
Machine shop	6
Rip-rap loaders (extra help)	4
General administration:	
Superintendent	1
Quarry foreman	1
Watchman	1
Clerk	1
Truck driver	1
Janitor	1
	— 6
Total	59

DETAILED COST—DIRECT OPERATIONS—1929

	Amount	Costs per ton: Based on 443,325 tons mined	Costs per ton: Based on 308,571 tons sold	Cost per cu. yd. of stripping based on 7700 cu. yd. removed
Stripping expense:				
Let by contract	$ 8,924.20	$0.0201	$0.0289	$1.159
Royalty to landowners	3,000.00	0.0068	0.0098	0.390
Total stripping	$11,924.20	$0.0269	$0.0387	$1.549
Drilling and blasting:				
Operating labor	5,849.48	0.0132	0.0190	.....
Fuel (gasoline)	1,886.70	0.0043	0.0061	.....
Water	117.00	0.0002	0.0004	.....
Lubricants and supplies	90.65	0.0002	0.0003	.....
Repair labor and material	2,465.89	0.0056	0.0080	.....
Explosives	16,653.78	0.0375	0.0539	.....
Total drilling and blasting	$27,063.50	$0.0610	$0.0877	.....
Shovel and loading expense:				
Operating labor	13,424.36	0.0303	0.0435	.....
Gas (natural)	5,076.97	0.0115	0.0164	.....
Power	417.00	0.0009	0.0014	.....
Water	654.44	0.0015	0.0021	.....
Lubricants and supplies	986.98	0.0022	0.0032	.....
Maintenance of shovels	10,556.98	0.0238	0.0342	.....
Maintenance of lines	1,242.90	0.0028	0.0040	.....
Changing shovel tracks	2,798.16	0.0063	0.0091	.....
Explosives (secondary)	4,559.41	0.0103	0.0148	.....
Total shovel and loading expense	$39,717.20	$0.0896	$0.1287	.....
Transportation expense: (From quarry to jaw crusher.)				
Operating labor	3,892.21	0.0088	0.0126	.....
Fuel oil	3,504.70	0.0079	0.0114	.....
Gas	526.80	0.0012	0.0017	.....
Water	337.33	0.0008	0.0011	.....
Lubricants and supplies	243.01	0.0005	0.0008	.....
Maintenance locomotives	2,525.90	0.0057	0.0082	.....
Maintenance dump cars	3,110.24	0.0070	0.0100	.....
Maintenance tracks	2,344.63	0.0053	0.0076	.....
Total transportation	$16,484.82	$0.0372	$0.0534	.....
Jaw crusher:				
Operating labor	2,731.54	0.0062	0.0089	.....
Power	1,749.86	0.0039	0.0057	.....
Water	112.00	0.0003	0.0004	.....
Lubricants and supplies	717.99	0.0016	0.0023	.....
Maintenance machinery	3,886.78	0.0087	0.0125	.....
Maintenance buildings	112.76	0.0003	0.0004	.....
Explosives (pop shots)	486.27	0.0011	0.0016	.....
Total crusher	$ 9,797.20	$0.0221	$0.0318	.....
Secondary crushing and screening expense:				
Operating labor	8,935.62	0.0202	0.0290	.....
Power	9,733.22	0.0219	0.0315	.....
Lubricants and supplies	991.42	0.0022	0.0032	.....
Maintenance machinery	7,481.49	0.0169	0.0242	.....
Maintenance buildings	170.62	0.0004	0.0006	.....
Total secondary crushing and screening	$27,312.37	$0.0616	$0.0885	.....
Waste disposal (screenings, clay, etc.):				
Operating labor	2,274.65	0.0052	0.0074	.....
Fuel oil	495.50	0.0011	0.0016	.....
Power	841.80	0.0019	0.0027	.....
Lubricants and supplies	51.55	0.0001	0.0002	.....
Maintenance of equipment	947.72	0.0021	0.0030	.....
Total waste disposal	$ 4,611.22	$0.0104	$0.0149	.....
Loading and switching expense:				
Operating labor	5,639.79	0.0127	0.0183	.....
Fuel oil	2,496.33	0.0056	0.0081	.....
Gas	258.35	0.0006	0.0008	.....
Water	337.35	0.0008	0.0011	.....
Lubricants and supplies	182.50	0.0004	0.0006	.....
Maintenance locomotives	2,425.19	0.0055	0.0079	.....
Maintenance storage bins	340.20	0.0008	0.0011	.....
Maintenance tracks and scales	2,817.78	0.0063	0.0091	.....
Total loading and switching	$14,497.49	$0.0327	$0.0470	.....

Modern Diesel Engine Practice

A COMPLETE treatise on the Diesel engine by Orville Adams, consulting diesel engineer, Dallas, Texas, has been published by the Norman W. Henley Publishing Co., 2 West 45th Street, New York City.

In this 600 page book which contains 390 illustrations much new information is given and it has been written to serve both as a text for study and reference and as a practical manual on operation and repairs.

All types of Diesel engines are covered, their commercial applications, best practice, installation details, operation, maintenance, repairs, operating costs, etc.

With the increasing use of Diesel engines this book should be helpful both to the executive and the operator. Several articles by Mr. Adams on the application of Diesel engines to the rock products field were published in Rock Products during 1929 and 1930.

State of Wisconsin Dodges Issue in Sand and Gravel Competition Case

AS MIGHT have been predicted, the state of Wisconsin (Department of Agriculture and Markets) has neatly side-stepped meeting the issue created by the competitive conditions in the sand, gravel and crushed stone industry described and commented on at length in ROCK PRODUCTS, September 26 and October 10. The official verdict or decision is as follows:

"Department of Agriculture and Markets
vs.
"Sand, Gravel and Stone Cooperative Association.

"In response to complaint by representative sand, gravel and stone dealers in and around Milwaukee, regarding methods of competition in the sand and gravel business in Milwaukee, the department held a public hearing on September 10, 1931, on a complaint issued by it.

"Complaint was made against the members of the Sand, Gravel and Stone Association as follows: That the 'members of said association and each of them have violated the contract that they entered into with the association and have repeatedly violated the rules and regulations of the association in the conduct of their business in that they have given secret rebates and price concessions in various forms in order to secure business and others have violated said rules by wilfully interfering with existing sales contracts between a member and its customer with the purpose and effect of inducing and causing a breach of such contract, and have further violated said rules and regulations by selling sand and gravel at or below cost for the purpose of injuring a competitor.'

"Complaint was made against non-members of the said association as follows: That 'defendants who are not members of the Sand, Gravel and Stone Cooperative Association of Wisconsin have resorted to unfair methods of competition and unfair trade practices in this; that they have wilfully interfered with existing sales contracts between other dealers and their customers with the purpose and effect of inducing and causing breach thereof. That at the time of such interference the said defendant and each of them knew of the existence of said contract; and in this that they have sold sand and gravel at or below cost for the purpose of injuring a competitor. And for the further purpose of destroying a competitor's business.'

"No evidence was introduced at the hearing to establish unfair methods of competition and no interested parties were able to present testimony or other evidence to substantiate the allegations made to the commission. Consequently, the complaint must be dismissed.

"The fact that the department cannot take action in this matter under the unfair competition statutes should not be taken to mean that there is official approval of the conditions now existing in the industry around Milwaukee. The present practices result from cut-throat competition and are economically wasteful, but do not constitute unfair competition. The industry should consider steps to set its house in order and in doing so may expect the friendly cooperation of the department.

"It is Therefore Ordered, That the complaint be dismissed, dated at Madison, Wis., this 9th day of November, 1931.

"Department of Agriculture and Markets.
"(Signed) W. F. RENK, Commissioner."

Pass Annexation Ordinance in Fight to Stop Sand Plant Operations

THE Tulsa, Okla., city commission has taken action paving the way for annexation of territory taking in the site of the Midland Sand Co., south of the present city limits and east of the Arkansas river.

There were no conditions attached to the commission's action.

It will be necessary to annex Burgess Acres, subdivision, and by this action the commission will have surrounded on three sides the territory in which the sand plant is located. Then other ordinances must be passed taking in the enclosed area.

Attorneys for the property owners who have been pressing this action have agreed with the city officials that the sand plant cannot be removed legally through the zoning process. They indicated that the plant might be permitted to remain temporarily, in view of the protection the neighboring residential areas would have against the further development of industry in that district. They said the plant could later be removed under the classification of a nuisance, but that the protesting citizens probably would be forced to go into court to obtain this end. They also admitted that the company could demand and get damages.

"That is a matter than can be handled later," the attorneys said. "The annexation step will prevent the sand company from constructing any further permanent structures in connection with its expansion."—*Tulsa* (Okla.) *Tribune.*

Make Improvements at California Sand and Gravel Plant After Sale

HARVEY G. MEAD, proprietor of the Felton Sand and Gravel Co., has sold the sand plant to R. M. Greathouse of Oakland, Calif. Mr. Mead has also given Mr. Greathouse a long lease on the sand deposit adjoining the plant.

Mr. Greathouse was formerly president of the G. and M. Gravel Co. before the company sold out to the Pacific Coast Aggregates, Inc. For the past two years he has devoted his time in the developing of a silica deposit near Brentwood, Calif. His company, known as the Silica Co. of California, is now supplying a pure silica sand to the glass industry in San Francisco and Oakland. The silica sand is also used as a molding sand in the steel industry both in northern and southern California.

A crew of carpenters and machinists are remodeling the plant and installing new sand washers which will not only increase the capacity of production but will also improve the quality of the sand.

The plant will also be equipped with trucks to make deliveries within a 10-mile radius of the plant.

Mr. Greathouse, who has been identified with the building material business for the past 10 years, says that "the sand deposit is one of the finest plastering and concrete sand deposits on the Pacific coast."

The main office of the Felton Sand and Gravel Co. will be located at 503 Merchants Exchange building, San Francisco.—*Santa Cruz* (Calif.) *Sentinel.*

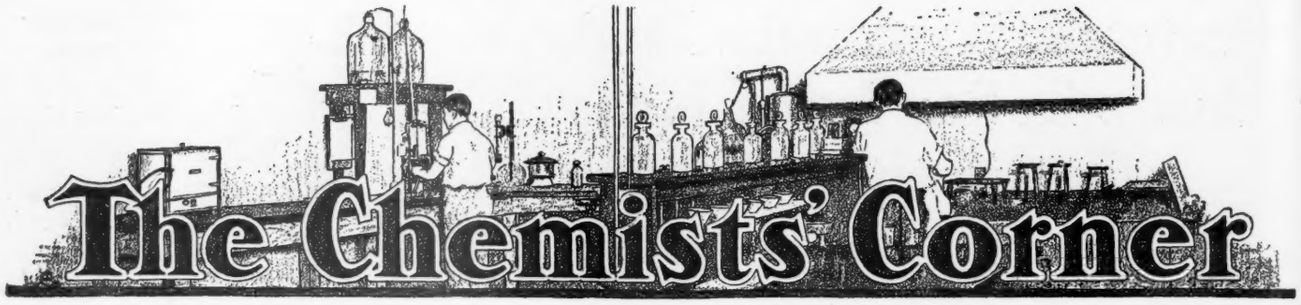
Minnesota County Makes Second Cut in Road Fund

FOR A SECOND TIME in four months the Nobles county, Minn., board of commissioners has used the pruning knife on the county road and bridge fund. At the July meeting it was cut from $150,000 to $100,000, and the latest slash pares that remainder another $20,000.

Highway Engineer Bray says that the cut will force abandonment of regraveling and reshaping plans. Very little new work was planned for 1932 excepting gas tax roads financed out of state funds, which will be proceeded with as planned.—*Sioux City* (Ia.) *Journal.*

Ford Motor Co. Buys Limestone Deposits Near Site of Proposed Blast Furnaces

THE FORD MOTOR CO. completed purchase November 10 of several thousand acres of limestone bearing lands in Chippewa and Mackinac counties, Michigan, from which will be obtained the fluxing material to be used in blast furnaces to be built at Gladstone, Mich., soon.—*Cleveland* (Ohio) *Press.*



Some Physical and Chemical Reactions Taking Place in a Rotary Cement Kiln

By T. G. Ludgate
Chief Chemist, Oregon Portland Cement Co., Lime, Oregon

SOME EIGHT MONTHS AGO our kiln was shut down without the formality of first cleaning it out and being of an inquisitive nature we seized the opportunity to see how and why the slurry came down the kiln. At the same time we took samples at intervals for the entire length of the kiln and these samples were analyzed and plotted on the accompanying chart.

Across the bottom of the chart is plotted the length of the kiln in feet, 0 being the clinker discharge end and 210 being the feed end or the point of introduction of the slurry.

A magnified scale is used to plot Al_2O_3, Fe_2O_3 and MgO, as otherwise the slight variations would not show: The H_2O curve is estimated from the points obtained, as owing to the lapse of time necessary for the kiln to cool off sufficiently to enter, a considerable amount of surplus moisture must have evaporated. The free lime curve proved very interesting.

Powdered coal of a fineness of 92% through 100-mesh and an ash content of 9% is used for burning. Air preheated to 400 deg. F. is used with the coal and both the volume and the temperature of this air are variable at will. Production from the kiln runs from 1200 to 1250 bbl. per 24 hours and the coal consumption averages 134 lb. per bbl. burned.

The tensile strengths of this product under the above conditions average:

At 3 days	315 lb. per sq. in.
At 7 days	370 lb. per sq. in.
At 28 days	465 lb. per sq. in.
At 3 months	470 lb. per sq. in.

This kiln is very much subject to ring formation in the area shown by the dotted lines and it will be noticed that this is the area where the material is subject to the most violent change, thereby giving support to the theory that rings are caused by too sudden a change from wet to dry. It is only natural that the larger the ring formation the more the downcoming feed is shielded from the heat and the more accentuated will be the change. It has, however, seemed that the kiln was more efficient when a slight neck or ring was in evidence than when perfectly clean, due no doubt to the tendency to hold the heat nearer the front end, but as the ring increases the efficiency of the kiln decreases sharply, evidently due to too much heat being held in front and the consequent cooling of the feed end to such an extent that the feed is not properly dried out before reaching the burning zone. It has been found on this kiln that a temperature of 800 to 840 deg. F. at the feed end is necessary for satisfactory operation.

Another fact of note is that the ring invariably forms at the tip of the flame and the greater the volume of air used, with its hotter and shorter flame, the closer the ring is formed to the front or discharge end of the kiln; also, the smaller the volume of air and the lazier or longer the flame the further away from the front is the ring. As the same size pipe is used, the velocity of the air increases with the volume.

A raw mix with a high degree of fineness produces rings of a very hard composition generally narrow in width and sometimes rising abruptly from the end of the coating. On the other hand a coarse raw mix forms a long tapering ring of a soft slabby character deposited in very conspicuous layers. Rings are more frequent with a low lime mix than with a high lime mix and also are decidedly more frequent with low fineness than with high fineness. Lastly, the higher the initial moisture in the slurry the greater the tendency toward the formation of rings, but if the slurry is too dry there is a decided likelihood of mud rings at the feed end.

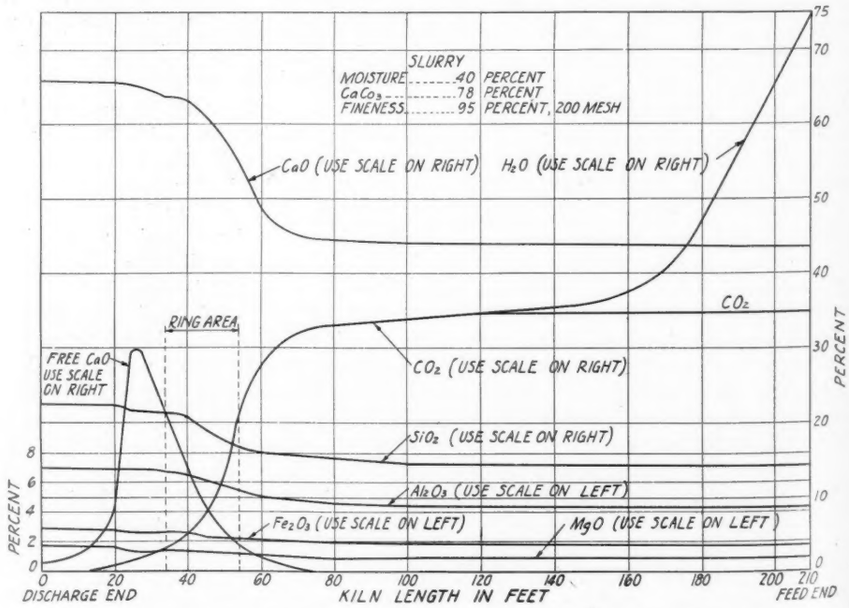

SLURRY
MOISTURE ..... 40 PERCENT
CaCO3 ..... 78 PERCENT
FINENESS ..... 95 PERCENT, 200 MESH
CaO (USE SCALE ON RIGHT)
H2O (USE SCALE ON RIGHT)
CO2
RING AREA
FREE CaO USE SCALE ON RIGHT
CO2 (USE SCALE ON RIGHT)
SiO2 (USE SCALE ON RIGHT)
Al2O3 (USE SCALE ON LEFT)
Fe2O3 (USE SCALE ON LEFT)
MgO (USE SCALE ON LEFT)
PERCENT
PERCENT
0 20 40 60 80 100 120 140 160 180 200 210
DISCHARGE END
KILN LENGTH IN FEET
FEED END

Chart showing analyses of material in rotary cement kiln

Sand-Lime Brick Production and Shipments in October

THE FOLLOWING DATA are compiled from reports received direct from 20 producers of sand-lime brick, located in various parts of the United States and Canada. The number of plants reporting is the same as for the September estimate, published in the October 24 issue. The statistics below may be regarded as representative of the entire industry in the United States and Canada.

Reports for the month of October indicate a slight decrease in production and an increase in rail shipments of sand-lime brick. Truck shipments, however, decreased somewhat as did unfilled orders. Stocks on hand show an increase over the previous month.

Average Prices for October

Shipping point	Plant price	Delivered
Dayton, Ohio	$11.00	$12.00
Detroit, Mich.	.....	14.50
East Windsor, Ont., Can.	.....	17.50
Grand Rapids, Mich.	.....	13.50
Jackson, Mich.	13.00	.....
Milwaukee, Wis.	9.00	11.00-12.00
Minneapolis, Minn.	8.00	10.50
Mishawaka, Ind.	10.00	.....
Pontiac, Mich.	11.50	13.50
Saginaw, Mich.	12.00	.....
Syracuse, N. Y.	18.00	20.00
Tampa, Fla.	8.50	.....
Toronto, Ont., Can.	9.90	12.00

Statistics for September and October

	*September	†October
Production	¶6,943,080	6,520,594
Shipments (rail)	871,500	977,000
Shipments (truck)	‡4,922,014	4,657,294
Stocks on hand	10,865,677	12,346,671
Unfilled orders	11,532,000	11,437,000

*Twenty plants reporting; incomplete, one not reporting stocks on hand and seven not reporting unfilled orders. †Twenty plants reporting; incomplete, six not reporting unfilled orders. ‡Includes 12,837 double brick. ¶Includes 9600 double brick.

Notes from Producers

Belt Line Brick Co., Minneapolis, Minn., has moved to 818 National Building, 527 Second Avenue South, Minneapolis.

Recent Prices Bid and Contracts Awarded

Lincoln, Neb. A contract to supply 1821 cu. yd. of gravel for surfacing several miles of the old state highway between Sterling and Tecumseh was let November 4 by the state purchasing agent to the Western Bridge and Construction Co., Omaha, at $1.78 per cu. yd. Other bids ranged from $1.83 to $2.

To repair a section of highway near Auburn, 60 tons of road gravel has been bought at $1.30 a ton.

Portland, Ore. Bidding $2.79 per bbl., the Monolith Portland Cement Co. offered the low figure for cement to F. R. Archer, warden, U. S. penitentiary at McNeil Island.

North Hollywood, Calif. The board of supervisors awarded a contract to the Monolith Portland Cement Co. to furnish 1450 bbl. of cement for flood control work on the Big Tujunga wash. The price paid was $2.40 per bbl. *Garner, Ia.* The Winnebago county board of supervisors and county engineers have purchased a quantity of gravel to be used in Winnebago county at $1.35 per cu. yd.

Memphis, Tenn. The Marquette Cement Manufacturing Co. will furnish 60,000 bbl. of portland cement for $78,000, or $1.30 per bbl., to be used at Caruthersville, Mo., and other points on the river where concrete revetment work is under way.

Elyria, Ohio. C. T. Biggs, county surveyor, was ordered by county commissioners to purchase 350 tons of slag at $1.40 per ton to make road improvements near here.

Madina, Ohio. Limestone for the paving of the streets which have been graded and are being graded under the village council's program of secondary street improvements was purchased in a session of council recently. The bid of Fred O. Bohley, of $1.62 per cu. yd. for 3265 yd., was $75 under that of the only other bidder.

New Pavement Awards

CONCRETE PAVEMENT yardage awarded in the United States during the month of October, divided according to roads, streets and alleys, as reported by the Portland Cement Association, and the totals for the nine months' period ending October 31, 1931, are:

	Yardage awarded during October, 1931	Yardage awarded to date, October 31, 1931
Roads	2,482,405	104,079,287
Streets	1,454,713	19,932,065
Alleys	71,839	752,090
Total	4,008,957	124,763,442

Commissioner Tries to Prevent Filing of Report in Blasting Case

COMMISSIONER Harry Buesser, of North Bergen, N. J., said he would apply to Vice Chancellor Bigelow to prevent the filing of a report made by Advisory Master Shipman on the effect of blasting in the township.

Application would be made within a few days, Mr. Buesser said, to prevent the Shipman report being used in court by George M. Brewster and Son, owners of the Belmont-Gurnes stone quarry. The Shipman report disagreed with Mr. Buesser's contentions that the blasting was wrecking North Bergen homes.

In the meantime the commissioner is being haled into the supreme court on application made by the quarry interests to test the validity of an ordinance passed in 1905 which prohibits blasting or even drilling in the township. The North Bergen commissioner has been cited to appear in the court at Trenton on November 10 with a copy of the ordinance.—*Union City* (N. J.) *Hudson Dispatch*

Announce Officers of Mississippi Portland Cement Corp.

ORGANIZATION of the Mississippi Portland Cement Corp., which is to manufacture cement from raw materials under option in northeast Mississippi, either in Oktibbeha or Noxubee counties, by use of natural gas from the Monroe county gas field was announced at Jackson, Miss., November 6 by George R. Hightower, fiscal agent of the corporation that has been chartered under the laws of Mississippi.

Andrew Fitzpatrick of New Orleans is president and chairman of the board of directors of the new corporation. President Fitzpatrick is identified with the financial and industrial interests of New Orleans and is president of a St. Bernard parish bank.

Other officers of the new corporation include: J. M. Evans of Jackson, president of the City Coal and Building Supply Co. and chairman of the executive committee of the Mississippi Builders and Supply Dealers' Association, vice-president; Frank J. Duffey, Natchez, secretary and treasurer; B. R. Alford, New Orleans, director and engineer in charge of construction and operation; A. S. Nunez, New Orleans, vice-president, and W. W. Magruder, Starkville, director and general counsel.

Construction of the plant, which will represent an investment of approximately $1,000,000, is scheduled to begin shortly after January 1. Officials of the corporation said that the plant will have a capacity of 1,000,000 bbl. of cement a year and will employ 125 persons.—*New Orleans* (La.) *Times-Picayune.*

Example of Cooperative Action

A NEW CONDENSED catalog has just been issued by the Stoker Manufacturers' Association. This 40-page illustrated catalogue describes 48 different types of mechanical stokers manufactured by the 14 member companies. It includes in one booklet the most recent developments in this line and is also interesting as an example of cooperative action by the leading manufacturers who it is understood produce some 95% of the total equipment of this kind. Copies may be obtained upon request from W. V. McAllister, secretary, Stoker Manufacturers' Association, Foot of Walker Street, Detroit, Mich.

Iowa Quarry Fatalities in 1930 High

IOWA QUARRIES reported the highest death rate resulting from accidents to their workers during 1930 of any state in the country with the exception of Utah, the Department of Commerce reports.

Among every thousand workers in Iowa quarries an average of 4.97 persons were killed during the year.—*Mason City* (Ia.) *Globe-Gazette.*

Hints and Helps for Superintendents

Repairing Broken Jack Screw

By C. H. Wright
Snyder, N. Y.

OFTENTIMES a jackscrew will break at the bottom or base of the jackscrew. When this happens it can be repaired so that it is better than when first purchased.

The accompanying illustration shows an old broken jack turned down and a steel base shrunk on, making the jack unbreakable. Any plant that has a lathe usually has plenty of old shafting lying around that could be made up into something beside a pile of rust.

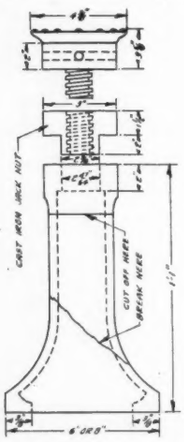


Fig. 1. Before repair

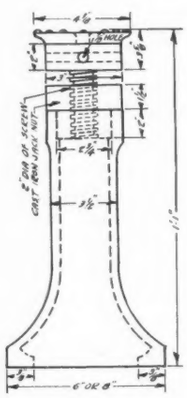


Fig. 2. After repair

Looking at Fig. 1, the ragged line shows where a cast iron jack usually breaks and the dark black line shows where the old jack base should be cut off and machined to be shrunk into steel base.

I made a small jack out of an old broken cast iron jack which measured, when complete, about 8 in. long. This is a very handy tool around a mill.

Fig. 2 shows the jack completed and ready to use.

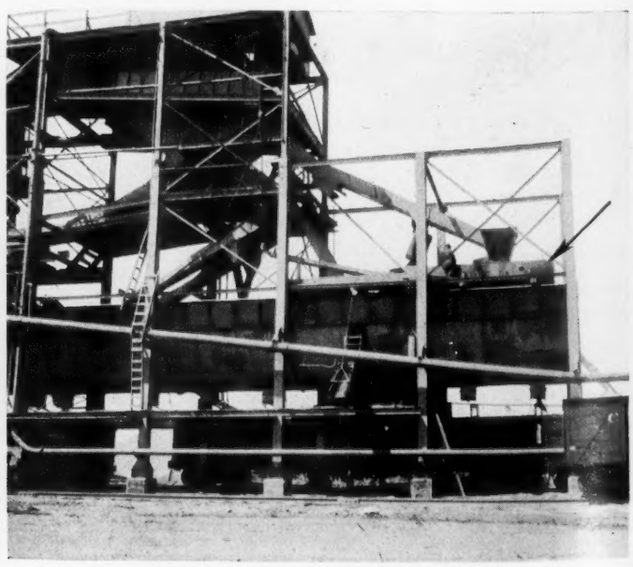
Sorting Belt

THE PLANT of L. G. Everist, Inc., at Hawarden, Ia., is of steel construction throughout and any changes that have been made since the plant was first built several years ago have been in keeping with the original design.

As Iowa's specifications have become stricter each year it became necessary to further eliminate such foreign material as shale, clay balls, etc., although the deposit does not carry more than the usual amount of that material as Iowa deposits run. However, a better product was wanted so a sorting belt was installed as shown in the two illustrations.

The gravel is passed through a scalper and the oversize crushed in an operation separate from the one shown here, after which the gravel passes up the incline to the rotary screen for a preliminary classification. The oversize is the only part of the aggregate that contains the shale, etc., so this is chuted to the belt from which men sort it. The belt is about 12 ft. long, center to center, and 24 in. wide and is driven by a 7-hp. induction motor through a Jones speed reducer.

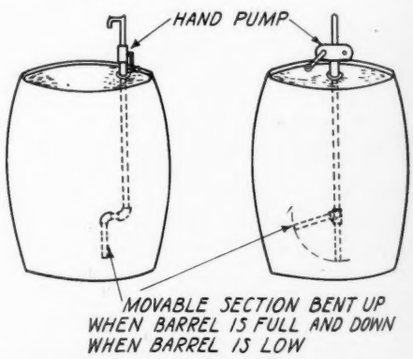
Workmen sorting foreign materials at sorting belt



Arrow indicates location of sorting belt

Self Reminder for Oil Barrels

WHEN only a small amount of oil is used around a plant and it is ordered only at infrequent intervals, it is often difficult to remember to order a new barrel until the old one is entirely empty.



Automatic reminder easily made

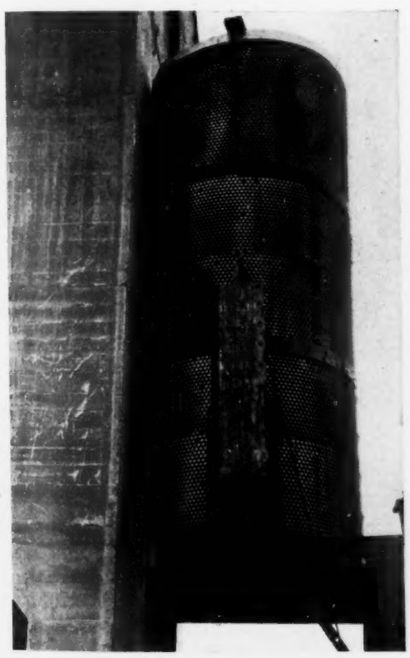
One way in which this difficulty may be automatically overcome is shown in the accompanying illustration. Instead of running the suction pipe straight down to the bottom it is shortened 10 or 12 in. and the cut off section threaded and again fastened on by means of two ells and a short nipple as shown.

When the pump is transferred to a new barrel the end of the suction pipe is bent up at about right angles (it can not be bent to a full 90 degrees because it will not go through the bunghole).

The pump will then draw oil as far as the end of the bent up section and at that point lose its suction. By pulling out the pipe and straightening its bent section the remaining 8 or 10 in. of oil remaining n the barrel can be used until the new order gets in.

Uses for Old Screen Sections

THE ACCOMPANYING ILLUSTRATION shows use No. 7498 for discarded rotary screen sections that members of the ROCK PRODUCTS staff have observed in their travels. This time the screen sections are

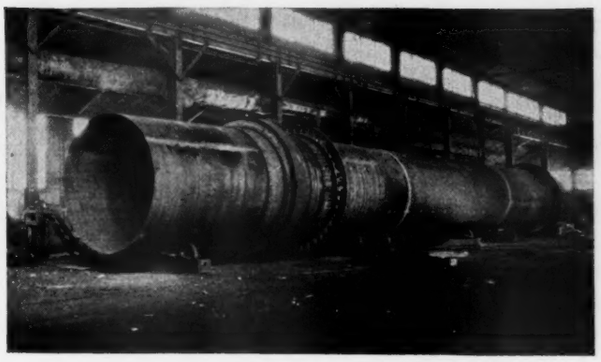


Small truck-loading bin

used for making a small truck-loading bin for holding crushed stone. The photo was taken at the Dundas plant of the Canada Crushed Stone Co., Ltd.

Repairing Broken Tires on Rotary Kiln

A CEMENT MILL superintendent in the Pacific northwest recently utilized the oxy-acetylene welding and cutting process to replace the broken tires on rotary kilns at his plant. The application



Kiln during welding of broken tire

of oxwelding to the problem not only materially lessened the time required, but also greatly reduced the cost of this work.

When the superintendent of the cement mill was faced with this problem due to the breaking of a tire 36 ft. in circumference and weighing 4 tons, he cast about for some method of avoiding the usual expense. Knowing the ease with which the oxy-acetylene process could be applied to all types of metal repair, he determined to find out whether it could solve his problem.

Since the tire had fractured in two places on opposite sides of the kiln, it was necessary to arrange to weld one side one day and the other side the following day.

The first operation was to bevel the edges of the fracture. This was accomplished rapidly with the oxy-acetylene cutting blowpipe. A temporary furnace of brick and asbestos paper was built around the part to be heated, and two oil burners were used to do the preheating. When the casting was at a dull red heat the welding was started. High Test steel welding rod was used to insure proper strength and soundness of weld metal.

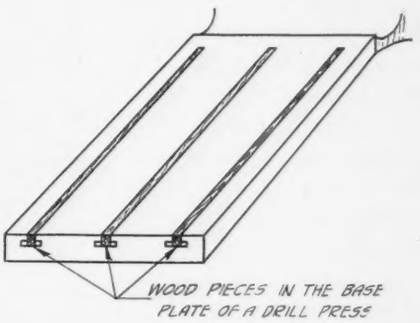
In order to take care of the contraction of the weld metal on cooling, the rivets for about 6 ft. on each side of the fracture were removed by the oxy-acetylene cutting blowpipe, and wedges were driven under the tire to expand it sufficiently to allow for contraction. The tread, or top section of the tire was welded first, and while this section was red hot the wedges were knocked out. This put the weld in compression. Next the flanges were welded, one welder working on each side from the flange towards the tread. In this manner they were able to keep the right heat across the tire and prevent the development of internal strains. After the weld was completed it was covered with asbestos paper and allowed to cool slowly.

The next day the kiln was rotated and the other fracture repaired in a similar manner. In this way more than seven-eights of the usual cost of a new tire and installation was saved. The mill superintendent was so pleased with the results that he immediately started plans for the reclamation of other kiln tires that had been discarded.—*Oxy-Acetylene Tips.*

For T-Slots of Machine Tools

By Charles Labbe
Death Valley, Calif.

WHEN not in use in the repair shop, the T-slots of machine tools act as receptacles for shavings, small tools or parts. To clean them takes time, so we



Rectangular sticks keep grooves clean

have fitted them with wood. The machines can be kept cleaner and no small pieces go astray in them. When the T-slots are needed, just take a screwdriver and lift the wood pieces out. It is unnecessary to cut the T-shape, a rectangular piece of the width and depth of the slot with a fairly snug fit being all that is needed.

Broken tire at point of weld

In Memoria---
William David Callender

W. D. CALLENDER, president of the Tradepress Publishing Corp., publisher of ROCK PRODUCTS, and of the journals *Concrete Products* and *Barrel and Box and Packages,* died November 9. He was 60 years old. Of old Colonial New York ancestry with Revolutionary soldiers as forebears, he was born at Rensselaer, N. Y. In his early manhood he himself saw service with the colors in the Spanish-American War.

W. D. Callender

Thoroughly trained from a mere lad in all the phases of the printing and publishing industry, he early entered the trade or business paper field. He was advertising manager of an early bicycle trade paper known as *The Wheel,* later advertising manager of *The National Provisioner.* Then he was with John A. Hill as advertising manager of *Engineering and Mining Journal.* Following that he moved to Chicago and established *MotorCycling,* with which he subsequently consolidated *Bicycling.* From the profits of this enterprise he purchased and published other journals, including ROCK PRODUCTS.

Upon me, as editor of ROCK PRODUCTS, is placed a difficult and heart-rending task for any man—to write the obituary of his employer, his business associate, his intimate and dearly beloved friend. This is the more difficult because, unfortunately, few of ROCK PRODUCTS' friends and clientele ever met—and fewer still knew—W. D. Callender, or had any conception of his part in it.

In the trade or business paper publishing field he was, of course, well known and highly regarded. In the business paper fields in which his earlier ventures and successes were made he had a host of personal friends—for to all his friends everywhere he was always a prince.

But "W. D." loved ROCK PRODUCTS the most of any of his papers, he was proudest of it, he always believed and always said, "ROCK PRODUCTS is an exceptional paper"; but he invariably added, with characteristic magnanimity and broad-mindedness, whether in my presence or not, "It is Rocky's work; it is his paper."

In a sense this is true, for my own work, of course, has been more tangible than his. But the time has come when, without lacking modesty, I can describe his part in the making of ROCK PRODUCTS and thus fulfill in some measure its debt and my own debt to W. D. Callender.

It is to give the reader an insight into the life, character and business policies of W. D. Callender, for as we have learned and profited much by his life's influence, so we believe can others. A trivial incident will illustrate: Some years ago, returning from an editorial jaunt which had included most of the cities from the West Coast to Atlanta, Ga., and had involved numerous public dinners of groups in our industry, I remarked banteringly to "W. D." that he was practically unknown to the rock products industry—that I was usually introduced as "the owner and publisher" of ROCK PRODUCTS, which naturally I did not deny in public. With a spontaneous smile and a warmth of feeling that sprang directly from the depths of his heart he said, "Go to it, Kiddo, you can't make me jealous!"

That was the key to this man's business philosophy and the key to his success as a publisher, as it would have been the key to his success in any line of human endeavor. For he possessed that greatness of soul and liberality of sympathy and understanding that mark *a very human man.*

And with that was a remarkable insight into human character and the ways of handling men.

He delegated authority and he asked only for results. He had certain principles for the good of the business that were paramount to all other considerations, which he never violated, although as an individual apart from his business

he constantly made amends for seeming austerity; he was ever a man of action. Those to whom he delegated authority and trust made practically all the decisions in connection with the management of their own papers. He so seldom made a direct request that I cannot here recall a single one. Suggestions were made and problems were discussed with a frankness and directness seldom encountered. But it was always you who made the decision; and should things go wrong he would ever have taken the responsibility upon himself. He would do this, of course, by saying he could have over-ruled. If he did actually over-rule, it was always done in his inimitable way, which ended in a hearty laugh all around.

Intense honesty and integrity and a very high sense of personal honor marked every move and every thought. He loved and lived in an atmosphere of simplicity, frankness and directness, and coupled with these virtues were a tolerance and kindliness of mind, a keen sense of humor, that made him a delightful companion and a most wise associate and counselor in private life as well as in business. Beneath a shell of apparent austerity, which he sometimes assumed for self-protection, beat a heart so generous and sympathetic that the number and extent of his friendships and his benefactions probably never will be known.

Mr. Callender purchased Rock Products in 1917—a vastly different journal from that which it now is. The same year I came into the picture as its editor. I had been trained in the publishing industry under such masters as Charles Whiting Baker, editor of *Engineering News,* and John A. Hill, its publisher, during most of that time. Mr. Callender had also been with John A. Hill as advertising manager of the *Engineering and Mining Journal,* as already noted, although several years before my day. Both of us had known and admired Mr. Hill as a publisher and as a man. I feel sure that "W. D.'s" business life and policies were as much influenced by John A. Hill's, as his own life and policies have influenced us of a little later generation.

Mr. Hill was probably the first large publisher of trade, business or professional journals to conceive them to be vehicles of genuine service to industry rather than mere media for carrying advertising. This meant the rise of business paper editors from a plane of scissors and paste-pots to the ranks of business men and industrial experts. That Rock Products is a result of such a policy of business paper publishing is obvious.

In all the fourteen years I have been associated with W. D. Callender I recall no instance where a sound recommendation was made to improve this journal, editorially, in its service to advertisers, mechanically, or in any way, that met with anything but encouragement and endorsement. Never in a single instance was there any pressure, or even the slightest suggestion of pressure, brought to bear on me as editor or manager to publish something that my own judgment or my own conscience dictated otherwise. To you who may know nothing of the newspaper or journalistic industry this may mean little, but to those who do it means everything, and explains in its entirety whatever success my associates and myself may have made of Rock Products. For it takes a very broad-gage and exceptional man and publisher to spend money as it has been spent on this journal, never losing sight, of course, of the fact that the object of publishing, as in any other industry, is to make a profit.

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Writing the obituary of a friend and business associate something more than two years ago, "W. D." said: "In the presence of death, life itself seems so futile. . . . Yet, upon reflection, is it a futility when the man has lived a full life, has given generously of himself, and has sweetened or inspired the lives of others?"

Measured by this, his own standard, W. D. Callender's life was far from futile. It was the most fruitful of any we know.

Directly he sweetened and inspired the lives of all who were associated with him in business. Indirectly, through his unfaltering faith in all that is best in the publishing industry, and his complete and unvarying support of his associates and employes in their earnest endeavors to serve industry, W. D. Callender's life has sweetened and inspired the lives of many who knew it not.

Those of us who had long been associated with him in the conduct of Rock Products, and the other journals of this company (thoroughly saturated with his ideals as we are) will continue to carry on as we know he would have us.

We, and you, have lost a friend and advisor; a most kindly, tolerant, wise and considerate one; a modest, sincere and honorable man; and the influence of such a man is too great to end with his life.

Nathan C. Rockwood

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As you say, we who knew him well knew what a prince he was. But he was more than that. He was not only one of the best judges of men I have ever known but he had the faculty of looking below the surface and finding the best in a man and helping him to bring it out. All who came in contact with him must feel that they owed him something for the inspiration and encouragement he gave them. I know that I do.

Edmund Shaw.

Dry Cleaning Gravel and Stone*

The Removal of Clay and Sand

By Alfred B. Searle

IN CONSIDERING the cleaning of gravel and stone—by which is meant the removal of clay, sand, and other objectionable materials—it will generally be agreed that if the material is sufficiently dry to permit a dry-process of cleaning to be used, such a process will have obvious advantages. It will avoid the use of water, remove the necessity for draining the gravel or crushed stone, and will, in some cases, also effect a considerable saving by eliminating the final drying of the material prior to tarring or other treatment.

The objections raised to all methods of dry-cleaning gravel and crushed stone are two—(1) the cleaning is ineffective, and (2) the plant and treatment cost more than washing.

The first of these objections certainly applies to gravel and crushed stone containing a noteworthy proportion of plastic clay, though if the material is thoroughly dried prior to the cleaning process, more of the clay will be separated later than if the damp stone had been treated. The objection is not as serious as is often supposed, because even a wet-process—as ordinarily used—does not effectively clean some stones and gravel, and though in extreme cases a wet-process will clean a clayey gravel more completely than a dry process, these extremes are unusual, and it would be foolish to apply to most sands and gravels as elaborate a process as is needed for abnormal material.

Another Objection

Another objection sometimes urged against dry-cleaning is that it can only be applied to a dry stone or gravel. If the raw material is damp it must be dried before it can be dry-cleaned. When the stone is to be tarred subsequently there is no objection to this preliminary drying, as it reduces, though it may not always eliminate, the drying later. The objection to drying cannot, in fact, be urged against the process when a tarred or coated stone is to be cleaned. Indeed, if a wet-cleaning process is used, the wet product will require much more drying than if a dry-cleaning process had been employed.

The objection—that a dry-cleaning process involves a higher cost of plant and treatment—does not apply to a well-designed plant.

*Paper read before the Institute of Quarrying of Great Britain.

Editors' Note

WITH the apparent increasing demand for crushed stone aggregate free from dust, great interest has been manifested in various localities in washing stone. The 1932 specifications of New York State originally called for all crushed stone to be washed. Water for washing at some quarries is hard to obtain. Consequently producers have turned their attention to the possibilities of dry cleaning their stone. The New York State specifications were subsequently revised to permit dry cleaning. American crushed stone producers seem to have had scant experience with dry cleaning stone. Hence the article reproduced here describing experience in Great Britain is particularly apropos.—The Editors.

Efficiencies

The comparative efficiencies of dry and wet cleaning, as applied to gravel and crushed stone, depend so much on the nature of the material, and particularly on the impurities present, that it is useless to dogmatize on the subject. When clay is present in amounts sufficient to require removal, the wet process usually has the advantage, but where the greater part of the material is sand, or the clay is of a lean, loamy nature, the dry-process is often cleaner and cheaper.

An objection which has been raised to the dry-cleaning process is the amount of dust it creates, but this defect is readily avoided by using a dust-collector. The production of slurry in the washing process is equally objectionable, though in a different way. Dust is more costly to collect than slurry, but dust can be disposed of far more cheaply than slurry. The objections to dust and slurry may, therefore, be allowed to cancel each other, leaving a slight balance in favor of the dry-cleaning process as far as this objection is concerned.

Wet or Dry Cleaning

The choice between a wet and dry cleaning process should ultimately depend on (1) the impurities in the stone; (2) the condition of the original stone or gravel, particularly as regards its moisture content; (3) the facilities for water and for the disposal of slurry or dust; and (4) the purposes for which the cleansed stone is required.

In both dry-cleaning and washing the first essential is to loosen the "impurities" to be removed. So long as a piece of clay or some damp sand adheres to a lump of stone or gravel so long will the latter remain uncleansed. It is a fact, that in several well-known washing plants a serious proportion of pieces of stone with clay or sand adhering to them do actually pass through the washer unaltered. Such a passage appears to be impossible, but the writer has been consulted with respect to more than a dozen washers having this defect. Some of the newer types of washer avoid the risk of discharging dirty stone, because the designers have realized that the first stage in the cleaning is to loosen the impurities so that they can easily be separated from the stone.

The Simplest Method

If the stone or gravel is sufficiently dry, the simplest and most effective method of loosening any adherent sand and clay is to "tumble" the material vigorously in a rotating drum. This will not cause any serious "grinding" or crushing of the stone, but it will loosen the small particles unless they are wet or unusually adherent. When once they have been loosened, these small particles are separated by screens or sieves in a very simple manner.

Damp Material

If the material is damp, it will be difficult to separate any adherent clay or sand, and the first stage in the dry-cleaning process must then consist in drying the crude material. The drying and loosening may be done simultaneously in a rotary dryer, though it is often better to keep the drying and loosening separate.

Great Care Needed

When clay is present, great care must be exercised in designing the plant not to allow the clay to be heated to such an extent that it is baked and assumes a stony nature. Overheating will do little harm in many instances, but as the overheated clay is usually much softer than the stone it tends to accumulate in the "fines" from the crushing plant, while if it is not crushed it behaves like soft pieces of stone.

When the crude gravel or stone is sufficiently dry there are various methods of treatment.

A Spiral Separator

A spiral separator is suitable for some materials. It consists of a large vertical spiral conveyor, the crude stone or gravel being fed onto the top and traveling down it with ever-increasing speed. The track of the spiral must have a suitable pitch or slope to enable the larger pieces to travel more rapidly than the sand and clay, and to fall off the edge of the last turn in the spiral while the rubbish is shot off the center of the track.

Various Fittings

Various fittings are supplied to regulate the feed, and also the separation and discharge of the material, and these devices must be accurately adjusted to meet local conditions.

Spiral separators will not separate more than about six tons of stone or gravel per hour. They cannot be made much larger or they lose their efficiency. They must not be overloaded or separation will not occur at all, nor will they separate stone or gravel in pieces less than 1 in. in diameter from sand and clay. The small gravel can be separated from the sand and clay by a screen or sieve.

Velocity of Material

The velocity of the material traveling down the spiral is affected by the weather, so that the separator must be completely enclosed, and if there is much dust, a dust extractor will be required.

When the material is suitable for spiral separators they are easy to control and cheap to maintain. They require skilled supervision, but one man can look after 20 separators when once the necessary adjustments have been made.

Air Separators

Air separators are not well suited to the dry-cleaning of stone and gravel as they require too much power to produce the requisite air pressure.

Moreover, the cleaning of sand and gravel does not consist—as is often supposed—in bringing them into contact with a fluid, but in using some method of loosening the sand and clay, and afterwards separating them from the stones or pebbles.

Air is a poor loosening agent, and some air methods for dry-cleaning stone and gravel are, in effect, little or no better than screens.

A Closed Circuit

If the air is used merely to carry away the small particles of sand, clay and dust, after they have been loosened by a drying and tumbling process, all the objections to air separators disappear, and a closed circuit, consisting of a "beater" or crusher and an air-separator, with the necessary connecting pipes, air heater, and fan, makes a very compact and efficient plant for cleaning stone and gravel.

If a coarse gravel has to be cleansed and the fine material is not required—as happens in localities where there is an abundance of sand and a much smaller quantity of gravel — dry-cleaning may often be effected by first drying the material by artificial heat in a rotary dryer, and then passing it over a series of corrugated rolls arranged side by side and all rotating in the same direction. The apices of the corrugations almost touch each other and the nodes or "hollows" thus form a series of spaces through which the small material passes and is separated. Some crushing of the material occurs, but this is usually disregarded. This method is not suitable for gravel in which pieces less than ½-in. diameter are to be retained.

Cost of Drying

The cost of drying the raw stone or gravel is not nearly so serious as is often supposed—partly because complete drying is not required. It is seldom necessary to remove the last 3% of water, and consequently the fuel used for the drying seldom exceeds one ton of coal for every nine tons of moisture in the stone or gravel.

Separation

Dry-cleaning alone is seldom best if the sand and other fine material separated from the gravel is to be sold. Under such circumstances it must be sufficiently free from clay to be salable, or it must be washed. Even in the case of very clayey gravels and sands a preliminary dry-cleaning is often economical as it limits the washing to the finer portion, where it is more effective and greatly reduces the amount of slurry produced. It has long been found that, by first drying a sand or gravel, "tumbling" it to loosen the fine material, and then separating it in the dry state, a material is obtained which can be washed far cleaner than one which has not previously been dry-cleaned.

Preliminary Work

This is important where gravel or crushed stone of superior quality is being treated. A preliminary dry-cleaning also eliminates much of the nuisance caused by silt and clay in the ordinary washing process, and keeps the wash-water much cleaner and more suitable for re-use.

Gravel and Clay

A gravel contaminated with clay in the plastic state cannot be cleansed merely by screening it and not always by washing. It is best if first dried and "drummed" so as to convert the clay into powder; later it may require to be washed. Dry cleaning or washing is equally suitable with some gravels, but for others a washing process is essential, because the water, in the loosening stage, can be forced between the adherent particles and the stone, and thus facilitates their separation in a manner which often seems to be easier than direct abrasion by "tumbling" the dry material.

Cleaning Sand

Some sands can be dry-cleaned equally as well as gravel, the coarser the sand the more effective being the cleaning.

In any process of dry-cleaning crushed stone or gravel, it is essential to use screens which are highly efficient. Vibrating screens are much superior to others because they aid the loosening of the fine particles as well as passing them more readily through the mesh of the screens.

A Constant Flow

It is also essential to have a constant and regular flow of material over the screens, and for this purpose the dryer should discharge the material into a bin from which it can be drawn with perfect regularity, independently of the delivery of the dryer. Other devices for securing an even flow of material over the screens are also useful.

A Dry Process

Neither the washing nor the dry-cleaning process is equally suitable for all stones and gravels, but the purpose of this paper will have been served if it draws the attention of some members of the Institute of Quarrying to the possibilities of cleaning some gravel and stone by a dry process instead of the ordinary method of washing, or if it enables some members to realize that a preliminary dry-cleaning often reduces the total cost of washing, because of the ease with which it separates the bulk of the finer, useless material in a convenient form before the gravel or crushed stone is washed in the ordinary manner.

Concrete Roads in India

AN INTERESTING BOOKLET on concrete roads in India has been issued by the Concrete Association of India at Bombay. In the introduction of this booklet a description of the Bates road test conducted by the state of Illinois in 1921-22 is described. This is followed by general information on concrete roads. Statements are then introduced by leading engineers on this type of construction. The remainder of the publication gives details on various roads in India. The illustrations of these roads are particularly interesting, as they depict a far different picture of the road requirements of India than most Americans visualize. Two-wheel ox carts predominate, though an occasional automobile is shown. The longest concrete road listed is given as 14 miles.

Rock Products Clinic

The Masonry Cement Pot Continues to Boil!

THE EDITOR: In your October 10 issue a correspondent representing lime interests expresses his appreciation to you for "your very splendid and unadulterated editorial" of July 18 in favor of lime. In the September 26 issue a correspondent representing a masonry cement hopes that the editor of ROCK PRODUCTS will carefully study all the facts available before "taking sides." In your August 15 issue a correspondent who is neither interested in lime nor masonry cements states that your editorial regarding masonry cement is "echoing the advertising campaign of the National Lime Association and is not worthy of technical discussion, etc."

It must be obvious to you that you have aroused the suspicion of many of your readers that you *have* "taken sides." I do not believe this, as I am convinced that you desire to be impartial, but I do feel that you have been "taken in" by the National Lime Association, who have capitalized parts of certain preliminary and inconclusive tests, made by an employe of a private organization, *at* and *not by* the Bureau of Standards, which are in favor of lime but who have totally ignored certain other parts of *these same tests* which show lime in a most unfavorable light.

First Tests Not Conclusive

That the tests noted above are preliminary and inconclusive is evidenced by the fact that the American Face Brick Association, which financed these tests, admitted that they were inconclusive and wrote to (*a*) various masonry cement manufacturers, (*b*) the National Lime Association and (*c*) the Portland Cement Association to join them in creating a joint fund to finance a new series of tests, to repeat the old tests, to extend them, and to endeavor if possible to bring to a more definite conclusion the virtues and defects of various cementing materials and various types of brick. Is it not logical to assume that had the American Face Brick Association considered the first tests as conclusive they would not have requested a repetition and extension of further tests?

In this connection permit me to call to your attention a statement in your original editorial in which you stated: "Our readers are not primarily interested in the brick." In all due respect to you, you are in error. When the writer showed your editorial to P. H. Bates of the Bureau of Standards he stated: "The brick are a most important factor in this situation." I am not criticizing brick, but it is a definite fact that there are leaky walls from the Atlantic to the Pacific with mortar composed of every known type of cementing materials and every type of brick. Neither am I criticizing lime or extolling the virtues of masonry cements. The new tests are in the making. They are in competent hands. Why not let the cold statements of the laboratory and the testing machine tell their own story rather than accept the opinion and propaganda of those who are partial to their own product?

The whole matter is too serious for any group of manufacturers of any particular product to make statements based upon inconclusive tests. Architects today are in the frame of mind of a sick man who welcomes any suggested remedy that is guaranteed to cure his illness. It has *not* been definitely decided through any conclusive tests that lime or any other cementing material will cure leaky brick walls, and it is not to the credit of the National Lime Association to take advantage of the situation by capitalizing on preliminary, uncompleted and inconclusive tests. It is not helping to solve but is rather confusing the problem.

Many Leaky Buildings

A careful investigation will disclose to you that there are as many leaky buildings in which mortar "rich in lime" was used as where masonry cements or portland cement has been used. We are prepared to send you quite a comprehensive list of such jobs with the exact names and locations. Your correspondent in your issue of October 10 mentions the Waldorf-Astoria Hotel in New York. We would suggest that you communicate with the contractors and ask them whether the mortar was the cause of the leaks on this job, and if not, what were the contributing causes.

As names have been mentioned, may we cite two of the most prominent buildings in Boston, Mass., where you can verify that mortar "rich in lime" was used (and the lime was slaked). These are the Public Service Building erected by the Turner Construction Co. and the U. S. Shoe Machinery Building erected by George A. Fuller Co. In the Public Service Building the water has leaked in so badly that some of the inside plaster is disintegrating and falling off. The same applies on the U. S. Shoe Machinery Building. I personally examined these buildings. We can mention other similar cases in Boston.

I do not infer that this is due alone to the mortar "rich in lime," or to the brick, or to the design. No one knows. It might be due to a combination of these factors. The workmanship appears to be very satisfactory and certainly no one can accuse such high-class contractors of poor workmanship.

Now, Mr. Editor, why not let us all look at this serious matter in a sensible manner? It has been stated that leaky walls were no problem 30 years ago. Is this really true? Why not investigate the facts? We know of reputable concerns who have been in the business of waterproofing leaky brick walls for almost 30 years and who have treated buildings 50 and 60 years old, in the days when plenty of lime was used and when there were no such materials as patent mortars on the market.

Why Some Brick Masonry Walls Leak

The fact is that we had leaky jobs with us as long as brick have been laid, but certainly not to the extent as in recent years, and why?

Thirty years ago most brick was porous.

Now we have brick that are both porous and almost as impervious as glass.

Thirty years ago most face brick were laid in thin mortar joints usually ⅛ in. thick and rarely over ¼ in. in thickness, and the joints were always tooled.

Today architects insist upon mortar joints as much as 1 in. in thickness, and for certain architectural effects many of them even refuse to permit mortar joints to be tooled.

Thirty years ago architects specified solid brick walls 12 to 18 in. in thickness.

Today architects specify 4 in. of face brick backed up with 8 in. of tile.

Thirty years ago most jobs were furred.

Today furring is an exception.

Thirty years ago the average building was four to six stories high and it was sheltered by surrounding buildings.

Today buildings "reach almost to the sky" and are unprotected from wind and rainstorms.

Let the Chips Fall as They May!

WE DID NOT anticipate that the editorial comment in the July 18 issue on masonry would result in producing so much interesting and relevant "copy," as it already has; and we haven't yet published all we have in hand.

The matter is so important that we ask the readers of the correspondence on this page to read also our editorial comment on another page of this issue.

We are glad we have started so many minds to thinking about a problem, or condition, of the building industry which hitherto had not been brought into the open and intelligently attacked, as it should have been, and must be, for the good of all.—The Editors.

Thirty years ago a bricklayer received $12 per week.

Today he receives almost as much per day.

Thirty years ago speed and production were unknown factors. It made very little difference whether a bricklayer laid 500 or 1000 brick per day, so long as the work was well done.

Today, on account of high wages, the bricklayers are almost driven to distraction to speed up bricklaying. Speed and good workmanship are possible but not probable partners.

It is true that we still use lime, cement and brick, but buildings are higher, the construction is lighter, there are new types of brick in use, mortar joints are heavier, and furring is almost a lost art.

Why Old Brick Masonry Was Good

An examination of old buildings laid with porous brick and thin mortar joints with heavy walls will disclose that after a rainstorm the brick have absorbed a great deal of water, but on account of the thickness of the solid brick wall the water has not penetrated clear through, and it subsequently is expelled by natural evaporation. But today, with buildings "sky high" with impervious brick, with extra heavy mortar joints, with improved mortar often as impervious as the brick, the water simply has no chance to seep through either the brick or the mortar, and naturally finds its way between the brick and the mortar.

The fact is that there was *no better* bond between brick 30 years ago than today, but the joints were thin, the brick were porous and the walls were heavy. As evidence of this I am sending you a photostat copy of a bulletin issued by Dow Service of New York City, dated December 20, 1924, when there was a great shortage of common brick and there was a great demand for second-hand brick. Dow Service states:

Statement of Service Company

New York destroys buildings at the rate of about 800 a year. It will not be many years before structures that are still comparatively modern but which have been laid up with cement mortar instead of lime mortar must be scrapped to make way for still more commodious structures. When that time comes there is now no present prospect of second hand brick being the factor in new construction work that it is today. In other words, when brick walls laid up with *cement mortar* are raised, the brick and cement are so tightly bound together that the brick breaks before the mortar gives way, hence the entire brick wall has to be figured as a loss.

Here is an impartial observation by a prominent building service organization made seven years ago definitely stating that if new construction is to look for a supply of second-hand brick it cannot depend upon such buildings "which have been laid up with cement mortar instead of lime mortar." What other construction can be put upon this statement than the fact that they actually observed that wherever lime mortar has been used a great deal of brick have been saved, which does not in practice seem to agree with the statement in your editorial of the bonding qualities of lime mortar.

Again I do not mean to infer that lime is inferior. I merely want to point out to you, by this actual observation, that there was no more bond between brick in the old days than today, and that if leakage was no problem then, it was because the porous brick and the thick walls were able to absorb considerable water without leakage penetrating clear through.

No one denies that there are hundreds of buildings in which lime mortar has been used which are satisfactory. No one denies that there are hundreds of buildings with impervious brick that are satisfactory, even though there are many contractors who still refuse to use impervious brick. By the same token there are hundreds of satisfactory buildings in which portland cement and masonry cements have been used. Yet the fact remains that there are leaky buildings with *all* types of mortar and *all* types of brick. The problem is to determine the contributing causes.

Wise to Withhold Judgment

It seems to me that we all can render a most valuable and constructive service to the industry to withhold all judgment until the new tests at the Bureau of Standards are completed. The brick manufacturers are concerned, otherwise they would not have instigated the new series of tests. They do not themselves know what part impervious brick plays in this tragedy. They are seeking "light." The portland cement manufacturers and the masonry cement manufacturers are also looking for "light," but through scientific tests and not through sales propaganda.

It behooves the National Lime Association not to confuse the issue, but to lend a helping hand to all concerned, in an endeavor to determine the real cause for leaky walls, instead of extolling the virtues of lime and condemning all other cementing materials. The new tests may develop that it is necessary to use a particular type of cementing material with a certain type of brick. It may be necesary to use lime in one case and portland cement or masonry cement in another case. It may develop that certain architectural design may have to be changed to meet modern conditions. Is it unfair to ask that everybody withhold judgment until the new tests are completed?

A. T. Malmed,
President, Hy-Test Cement Co.,
Philadelphia, Penn.

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THE EDITOR: In the July 18 issue of Rock Products you discussed volume changes subsequent to hardening of masonry mortars. The article to which you refer clearly shows that mortars rich in cement show a greater volume change upon alternate wetting and drying than that found in lime mortars or portland cement rich in lime (2 lime, 1 cement).

The editorial was criticized in the September 26 issue by John H. Mallon of the Louisville Cement Co., manufacturers of masonry mortars. He takes exception to your editorial commenting on lime mortars discounting the expectation of a great reduction in leaking masonry from an increase of lime in mortars.

We cannot agree with some of Mr. Mallon's objections and feel fairly well qualified to take exception to some of his remarks, as our business is repairing leaking and defective masonry. Our knowledge of good masonry is indeed limited, as we confine our efforts entirely to correcting wet and defective walls, and we have come to very definite conclusions as to the causes of such troubles. What success we have had in rendering a cure is due to a proper analysis of the cause, which can be summed up in two words—namely, cracks and holes.

We will first deal with the shrinkage phase of the problem. We cannot agree with Mr. Mallon that if a wall leaks, it leaks as soon as the first rainstorm hits it. Our experience has taught us that there is no definite conclusion to be drawn on this situation. Some buildings we have worked on leaked immediately after construction, while others showed no signs of water damage for several years, during which time many severe, driving rains had beaten against the masonry. To us the picture is very clear and definite. In fact, the whole difficulty lies in its simplicity.

No Bearing on Problem

Mr. Mallon's statement that absorption of any mortar is in direct proportion to the amount of lime in the mortar is confusing when discussing causes of leaking masonry. This has no bearing on the problem, for the amount of leaks in a wall is in direct proportion to the amount of cracks and holes, which are due in a large measure to lack of plasticity and to volume changes. As shrinkage cracks and holes is the problem that is facing us, and not absorption, serious consideration should be given to a mortar that would help to eliminate these sources of trouble. For this reason we recommend a mortar with flowability, that will go into hidden cavities where the masons fail to force it, and to assist adhesion where the masons fail to shove the brick. Water that enters a wall due to the porosity of the masonry is so broken up through capillaries that it only causes the masonry to become damp. The actual presence of liquid water will not occur unless the masonry contains holes and shrinkage cracks where the water can accumulate.

The last paragraph of Mr. Mallon's article bears repeating:

The emplasis the editorial places on the differences in minor characteristics of mortar confuses rather than clarifies the leaky wall problem. Because even the difference between the most ex-

treme types of mortar is of little importance compared with the proper (1) workmanship; (2) design and construction details; (3) absorption of the brick at the time it is laid in the wall; (4) type of joint selected; and probably other less important conditions.

Plasticity Greatest Factor in Quality

Let us first discuss *No. 1—Workmanship:* Assuming that a workman is qualified and has the desire to shove and fill all joints completely, he is terribly handicapped if forced to use a mortar lacking proper plasticity or flowability. Too little emphasis has been placed on plasticity, which in our minds is the greatest factor to be considered as far as quality of mortar is concerned. Both the good and the cheap builder usually employ about the same class of bricklayer, and any difference in result should be due to supervision and care, assuming everything else is equal. The best evidence that workmanship is overshadowed by an improper mortar is proven conclusively by the fact that on cheap construction where the contractor is trying to save money on every item, there is considerably less leaking masonry than is found in the very finest construction. The answer is simple. The cheap builder uses the most economical mortar, which also possesses one outstanding quality—plasticity. If our experience in correcting defective masonry could be used as a final criterion, then we would state that although there may be lime mortar walls that leak, we have never been called upon to repair leaks on these, with the exception of occasional cases where a defective roof, downspout or improper drips has been the cause.

No. 2—Design and construction details: This is partly answered in No. 1. Another phase might be the manner in which the masonry units are laid, such as Flemish bond, running bond and English bond. In the final analysis of the cause of leaking masonry these various designs are hardly worth discussing.

No. 3—Absorption of brick at time it is laid in wall: We are not qualified to answer this completely, but assuming that improper absorption reduces the bond, we do not believe that if the joints, both bad and vertical, are well filled the full depth of the brick, that the shrinkage crack would allow the entrance of water to such a generous degree as is found in most leaking masonry walls.

Well Worth Considering

No. 4—Type of joints selected: This is a phase that is almost as greatly misunderstood as absorption. We ourselves for a number of years believed that the flush, plain cut or raked joint caused more trouble than any other type of joint. Our experience, however, has now taught us that these types of joints are only slightly more detrimental than others. Very fortunately we have in our office what is known as the "graveyard," where we keep at least one piece of mortar joint from every masonry wall where we have removed defective mortar, and out of more than a hundred we have discovered that less than 5% are raked or cut joints. This does not give us any definite figure to work on, as we do not know what percentage of masonry walls are constructed with this type of joint, but it is a matter well worth considering if anyone attempts to blame leaks on the type of joint alone.

Mr. Mallon feels that the statement, "The change from lime mortars to cement mortars has caused leaky walls," cannot be reconciled with the fact that in proportion to the lime mortar used, there have been just as many leaky lime jobs as leaky cement jobs. We believe the fundamental way to investigate and form a conclusion to such a statement would be to get the early history of the waterproofing manufacturers who are making proprietary materials to counteract leaking walls, and we will find that the demand for these materials—which naturally comes before the manufacturing—started at about the time the use of mortars that did not possess sufficient plasticity became popular.

We wish to go on record as not being subservient to any company or material, as we are solely interested in replacing defective joints to render masonry water-tight. We quite agree with the editor and feel that he has approached the subject in an unbiased and enlightening manner.

STANLEY NEWMAN, Treasurer,
Stanley Newman Co., Boston, Mass.

* * * *

More Publicity Than It Deserves

THE EDITOR: Bureau of Standards Research Paper No. 321 pertaining to volume changes of brick masonry materials, has been given far more publicity than it merits. Another publication, Research Paper No. 290, has received much less consideration although it probably is more relevant to the subject of leaky walls than 321.

It would be well if we could all talk the same language. To show that we do not, consider the various meanings attached at present to the term, "initial shrinkage."

When any wet mortar is placed on a rapidly absorbing brick it quickly stiffens due to loss of water which goes into the brick. This happens within a very few minutes. The mortar "packs" under these conditions. Is this packing "initial shrinkage"? The extent of packing that occurs during a definite length of time is dependent upon two things. These are, the rate of absorption of the brick and the water retaining capacity of the mortar. Bricks and mortars vary considerably from this standpoint. Certain mortars lose water on a "standard" porous base more rapidly than others.

Getting an initial bond involves adapting the mortar and brick to one another. The writer has "bonded" at least 55 different types of bricks with at least 30 different mortars without any difficulty after he had learned how to do it. It was necessary to wet certain bricks to a certain extent and to lay other bricks completely dry with *all* of the mortars By working rapidly in laying the fast absorbing bricks it was not necessary to wet any of the 55 types of bricks when certain ones of the 30 mortars were used

If the builder does not know when and when not to wet bricks, failure to secure an initial bond cannot be called "poor workmanship," if complete information on the subject is not available to him. Poor workmanship is another much abused term.

The sudden packing of mortars on a porous base offers a difficulty to the mason in getting complete contact between the bed of mortar and the brick that he is placing on it. This quick packing of the mortar occurs prior to its undergoing any appreciable cementing action with a consequent development of high cohesion. The water to cement ratio is quickly reduced during the packing of the mortar on a brick of high suction, and this results in a lower "initial shrinkage" of the mortar than would be realized were it on a non-absorbent base, as J. C. Pearson has clearly indicated in his publications. If, however, the "packing" is considered as "initial shrinkage," then the reverse would be true.

Packing is along the vertical direction for the most part whereas "initial shrinkage" is more or less in every direction. Cohesion through "cementing action" increases and as drying proceeds, all particles are drawn or urged toward the center of mass of the mortar with a consequent diminution of volume. This is shrinkage during early hardening and is usually referred to as "initial shrinkage."

Remedy Suggested

Sudden packing of mortar interferes with the development of good initial adhesion. This may be remedied either by wetting the bricks or by finding a means of retaining the water within the mortar, keeping it plastic, for a longer period of time. Illustrations of poor adhesion of mortar to a fast absorbing brick, not wetted, are given in Bureau of Standards Research Paper No. 290.

"Initial shrinkage" may also interfere with the proper development of adhesion. However, we must consider the rate of hardening as well as both the rate and magnitude of the "initial shrinkage" in this connection. The weight of masonry could possibly cause appreciable flow in a mortar which is undergoing shrinkage and which yet has some plasticity.

The writer suggests that it would be well not to confuse the two entirely different things, sudden packing on a porous base and shrinkage during early hardening.

L. A. PALMER,
Research Associate,
U. S. Bureau of Standards.
Washington, D. C.

Editorial Comment

More About Masonry Cements

We have no apologies to make for anything published in the editorial in Rock Products, July 18, on "Masonry Cements." That we had ample basis for our comments is proved by the correspondence on other pages of this present issue alone. But that the subject is too large and complicated and many-sided to be dealt with adequately in such a brief editorial is now obvious.

We regret only that much of ire that might be directed with entire justification at the editorial in question seems to be misdirected at the Bureau of Standards. For while in the main the editorial commented on the findings of the research work at the Bureau, it contained a reference to the development of masonry mortar troubles as coincident with the introduction of so-called masonry cements. That thought was entirely our own, based on other information, or ideas if you will, than those contained in Mr. Palmer's Bureau of Standards report.

In explanation of Mr. Malmed's criticism of Mr. Palmer's work, in these columns, the reader should bear in mind that these research fellows (of which Mr. Palmer is one) are maintained and their work paid for from funds supplied by interested industries. And while the results of their work have been criticized before and will continue to be criticized, no doubt, because of interpretations made by interested parties, the reports themselves contain established facts only.

Actually these research fellows are under the same regulations that pertain to other members of the Bureau's staff. The Bureau carefully scrutinizes the reports of its research fellows, and all their publications are subject to the same scrutiny before publication as is given to the publications of other members of the Bureau's staff, who may be on the U. S. Government's payroll. The Bureau, of course, cannot be responsible for the interpretations put on such work by interested parties for commercial purposes.

As stated in the beginning, Rock Products has no apologies to make nor further regrets. The editorial which has produced so much good "copy" for the editor was intended for just that purpose, by bringing out into the open a subject which has been much discussed in private and about which much erroneous propaganda has been circulated. For the good of all interested in better masonry construction it is desirable to get at the facts. And out of all this discussion—and the continuation of the research work—should come more facts. Needless to repeat, Rock Products has no favorites among its producer readers, and is interested only in promoting the search for truth.

Reinforced Concrete for Federal Buildings

The use of reinforced concrete in building construction is not new. Its application to all types of industrial and commercial projects has been recognized as an important development in the evolution of modern building construction. Such disasters as the San Francisco earthquake and the Florida hurricane have emphasized its contribution to greater stability and safety. Years of experience have evidenced the economies that result with its adoption, in addition to those features that add to the quality of the construction.

The acceptance of these proved advantages and the discovery and application of better field control and production methods in the use of reinforced concrete have greatly extended its field. At present the 23-story building of reinforced concrete is not uncommon. The use of long-span reinforced concrete girders where architectural or operating requirements have demanded them is widespread. Higher strength concretes providing greater bending and shear resistance have made it possible to span much greater distances than heretofore without excessive depth of members. Quick-hardening cements provide the speed element sometimes essential. In short, the limitations in the use of reinforced concrete are few; economical uses many.

While these facts have been established throughout the construction industry and reinforced-concrete construction has been used on many of the larger construction projects, we still find certain important projects where it seems no consideration has been given these benefits. On federal buildings costing $1,000,000 and over, structural steel frames only are specified. Many of these buildings could be built at a saving by the use of reinforced-concrete framework in place of structural steel. On what basis can a federal agency be so extravagant with public money that it refuses the economies of competitive bids on materials? When private industry welcomes these savings and the greater values to be had with reinforced concrete—it has done so for years—how long should be required to gain this recognition from a government bureau?

These savings might increase public construction projects by another 5 or 10% in volume without increasing cost, a most desirable result. Immediate recognition and approval should be granted this proposal. If competition is so essential in private enterprise—and our government has spent millions of dollars to force competition within industry—why shouldn't it be practiced in governmental buying of construction materials? The rock products industry should join together in demanding fair consideration in this matter.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[27]	11-18-31	80	90	
Alpha P. C. new com.[2]	11-14-31	10½	12	25c qu. Oct. 24
Alpha P. C. pfd.[2]	11-14-31	90	110	1.75 qu. Sept. 15
Amalgamated Phosphate Co. 6's, 1936[19]	11-13-31	93½	100	
American Aggregates com.[19]	11-13-31	3½	4½	75c qu. Mar. 1
American Aggregates pfd.[19]	11-13-31	10	30	1.75 qu. Oct. 1
Amer. Aggr. 6's, w.w.[19]	11-13-31	48	55	
Amer. Aggr. 6's, ex-w.[19]	11-13-31	45	52	
Amer. L. & S. 1st 7's[27]	11-18-31	91	94	
American Silica Corp. 6½'s[39]	11-18-31	No market		
Arundel Corp. new com.	11-16-31	29	29⅞	75c qu. Oct. 1
Bessemer L. & C. Class A[4]	11-13-31	.....	13½	50c qu. Aug. 1
Bessemer L. & C. 1st 6½'s[4]	11-13-31	.....	58	
Bloomington Limestone 6's[27]	11-18-31	20	25	
Boston S. & G. new com.[37]	11-13-31	5	7	15c qu. Oct. 1
Boston S. & G. new 7% pfd.[37]	11-13-31	32	37½	87½c qu. Oct. 1
California Art Tile, A	11-12-31	.....	5¼	43¾c Mar. 31
California Art Tile, B[40]	10-29-31	.....	3	20c qu. Mar. 31
Calaveras Cement com.[9]	11-12-31	.....	10	
Calaveras Cement 7% pfd.	11-12-31	.....	75	1.75 qu. Oct. 15
Canada Cement com.	11-16-31	8½	8¾	
Canada Cement pfd.	11-16-31	79¾	.....	1.62½ qu. Sept. 30
Canada Cement 5½'s[42]	10-30-31	85	90	
Canada Crushed Stone bonds[42]	10-30-31	78	88	
Canada Crushed Stone com.[42]	10-30-31	5	.....	
Canada Crushed Stone pfd.[41]	10-27-31	.....	75	
Certainteed Products com.	11-17-31	4	4⅜	
Certainteed Products pfd.	11-17-31	25	26⅝	1.75 qu. Jan. 1
Cleveland Quarries	11-18-31	.....	50	25c qu. Dec. 1
Columbia S. & G. pfd.	11-17-31	89	91	
Consol. Cement 1st 6½'s, A[44]	11-18-31	No market		
Consol. Cement notes, 1941[27]	11-18-31	No market		
Consol. Cement pfd.[27]	11-18-31	.....	60	
Consolidated Oka Sand and Gravel (Canada) 6½'s[12]	11-16-31	95	97	
Consolidated Oka Sand and Gravel (Canada) com.[41]	10-27-31	.....	7	
Consolidated Oka Sand and Gravel (Canada) pfd.[41]	11-10-31	60	75	1.75 qu. Oct. 10
Consol. Rock Prod. com.[9]	11-12-31	25c	35c	
Consol. Rock Prod. pfd.[9]	11-12-31	2	2½	43¾c qu.June1,'30
Consol. Rock Prod. units[35]	11-12-31	3½	4½	
Consol. S & G. pfd. (Can.)	11-17-31	.....	70	1.75 qu. Nov. 16
Construction Mat. com.	11-17-31	1⅛	3	
Construction Mat. pfd.	11-17-31	3	10	87½c qu. Aug. 1
Consumers Rock and Gravel, 1st Mtg. 6's, 1948[35]	11-12-31	57	62	
Coosa P. C. 1st 6's[23]	11-13-31	35	.....	
Coplay Cem. Mfg. 1st 6's[19]	11-13-31	55	65	
Coplay Cem. Mfg. com.[33]	11-13-31	5	7½	
Coplay Cem. Mfg. pfd.[33]	11-13-31	25	40	
Dolese and Shepard	11-17-31	24	26	$1 qu. Oct. 1
Dufferin Pav. & Cr. Stone pfd.[42]	10-30-31	.....	68	1.75 qu. Oct. 1
Dufferin Pav. & Cr. Stone com.	11-17-31	5½	6	
Edison P. C. com.[32]	11-13-31	1½	.....	
Edison P. C. pfd.[32]	11-13-31	5	.....	
Federal P. C. 6½'s, 1941[19]	11-13-31	70	90	
Giant P. C. com.[2]	11-14-31	2	4	
Giant P. C. pfd.[2]	11-14-31	8	13	1.75 s.-a. Dec. 15
Gyp. Lime & Alabastine, Ltd.	11-16-31	6	6¼	10c qu. Oct. 5
Gyp. Lime & Alabastine 5½'s.	11- 9-31	70	80	
Hermitage Cement com.[11]	11-13-31	15	25	
Hermitage Cement pfd.[11]	11-13-31	65	70	
Ideal Cement, new com.[29]	11-14-31	23	25	50c qu. & 50c ex. Oct. 1
Ideal Cement 5's, 1943[29]	11-14-31	99	101	
Illinois Electric Limestone 1st 7's[38]	9-18-31	.....	90	
Indiana Limestone units[27]	11-18-31	No market		
Indiana Limestone 6's	11-13-31	16	20	
International Cem. com.	11-17-31	23	24	$1 qu. Sept. 30
International Cem. bonds, 5's	11-17-31	78	79	Semi-ann. int.
Iron City Sand & Gravel 6's, 1940[36]	11-13-31	.....	80	
Kelley Is. L. & T. new stock	11-17-31	17½	19⅝	50c qu. Oct. 1
Ky. Cons. Stone com.	11-17-31	3¼	4	
Ky. Cons. Stone pfd.	11-17-31	.....	77¼	1.75 qu. May 1
Ky. Cons. St. 1st Mtg. 6½'s[38]	11- 4-31	.....	70	
Ky. Cons. Stone V. T. C.[38]	11- 4-31	.....	2	
Ky. Rock Asphalt com.	11-17-31	3½	4¼	40c qu. Oct. 1, '30
Ky. Rock Asphalt pfd.	11-17-31	36½	39	1.75 qu. Dec. 1
Ky. Rock Asphalt 6½'s	11-17-31	83	88	
Lawrence P. C.	11-16-31	18	22	$1 qu. June 30
Lawrence P. C. 5½'s, 1942[2]	11-14-31	45	52	
Lehigh P. C. com.	11-17-31	7	8	25c qu. May 1
Lehigh P. C. pfd.	11-17-31	82	85	1.75 qu. Jan. 2
Louisville Cement[7]	11-12-31	100	150	
Lyman-Richey 1st 6's, 1932[13]	11-13-31	95	.....	
Lyman-Richey 1st 6's, 1935[13]	11-13-31	90	.....	
MarbleheadLime 6's[14]	11-13-31	75	85	
Marbelite Corp. com. (cement products)	11-13-31	.....	1	
Marbelite Corp. pfd.	11-13-31	1	.....	50c qu. Oct. 10, '30
Material Service Corp.	11-17-31	15½	17	50c qu. June 1
McCrady-Rodgers 7% pfd.[22]	11-12-31	40	45	87½c qu. Sept. 30
McCrady-Rodgers com.[22]	11-12-31	10	15	75c qu. Jan. 26
Medusa Portland Cement	11-17-31	.....	20	75c qu. Apr. 1
Michigan L. & C. com.[6]	11-16-31	45	.....	
Missouri P. C.	11-17-31	.....	17½	25c qu. Oct. 31
Monolith Portland Midwest com.[9]	11-12-31	75c	1	
Monolith P. C. com.[9]	11-12-31	1½	2	40c s.-a. Jan. 1
Monolith P. C. pfd.[9]	11-12-31	3½	4	40c s.-a. Jan. 1
Monolith P. C. units[9]	11-12-31	8½	10	
Monolith P. C. 1st Mtg. 6's[9]	11-12-31	65	70	
National Cem. (Can.) 1st 7's[27]	11-18-31	74	.....	
National Gypsum A com.[27]	11-18-31	2	3	
National Gypsum pfd.[27]	11-18-31	34	38	1.75 Oct. 1
Nazareth Cement com.[25]	9-19-31	.....	10	
Nazareth Cement pfd.[25]	9-19-31	.....	85	
Newaygo P. C. 1st 6½'s[27]	11-18-31	72	75	
New England Lime 6's, 1935[19]	11-13-31	30	60	
N. Y. Trap Rock 1st 6's	11-14-31	84½	86½	
N. Y. Trap Rock 7% pfd.[30]	11-13-31	65	.....	1.75 qu. July 1
North Amer. Cem. 1st 6½'s	11-17-31	30 actual sale		
North Amer. Cem. com.[27]	11-18-31	50c	2	
North Amer. Cem. 7% pfd.[27]	11-18-31	4	8	
North Shore Mat. 1st 5's[15]	11-18-31	No market		
Northwestern States P. C.[31]	11-16-31	.....	75	$2 Apr. 1
Ohio River S. & G. com.	11-17-31	.....	8	
Ohio River S. & G. 7% pfd.	11-17-31	.....	98	
Ohio River S. & G. 6's[16]	11-13-31	.....	80	
Oregon P. C. com.[9]	11-12-31	8	12	
Oregon P. C. pfd.[9]	11-12-31	80	85	
Pacific Coast Aggr. com.[40]	10-29-31	.....	1	
Pacific Coast Aggr. pfd.	11- 7-31	.....	1½	
Pacific Coast Cement 6's[5]	11-12-31	79	.....	
Pacific P. C. com.	11-12-31	6	10	
Pacific P. C. pfd.	11-12-31	49	53	1.62½ qu. Oct. 5
Pacific P. C. 6's[5]	11-12-31	93	.....	
Peerless Cement com.[21]	11-16-31	50c	1½	
Peerless Cement pfd.[21]	11-16-31	5	20	1.75 qu. Apr. 1
Penn.-Dixie Cement com.	11-17-31	1¼	1¾	
Penn.-Dixie Cement pfd.	11-17-31	7½	9	
Penn.-Dixie Cement 6's	11-14-31	42	43	
Penn. Glass Sand Corp. 6's	11- 6-31	92	96	
Petoskey P. C.	11-17-31	3	3¾	15c qu. Apr. 1
Port Stockton Cem. com.[9]	11-12-31	No market		
Riverside Cement com.	11-12-31	.....	9	
Riverside Cement pfd.[5]	11-12-31	54	58	1.50 qu. Nov. 1
Riverside Cement, A	11-12-31	.....	15	15c qu. Feb. 1
Riverside Cement, B[9]	11-12-31	70c	1	
Roquemore Gravel 6½'s,[17]	11-13-31	98	100	
Sandusky Cement 6½'s, 1931-37[19]	11-13-31	70	95	
Santa Cruz P. C. com.	11-12-31	80	.....	$1 qu. Oct. 1
Schumacher Wallboard com.	11-12-31	.....	6	25c qu. June 27
Schumacher Wallboard pfd.	11-12-31	.....	18	50c qu. Nov. 15
Southwestern P. C. units[35]	11-12-31	225	.....	
Standard Paving & Mat. (Canada) com.	11-17-31	4½	5	50c qu. May 15
Standard Paving & Mat. pfd.	11-17-31	.....	60	1.75 qu. Nov. 16
Superior P. C., A	11-12-31	33	35	27½c mo. Dec. 1
Superior P. C., B	11-12-31	10	12	25c qu. Mar. 20
Trinity P. C. units[31]	11-16-31	85	95	
Trinity P. C. com.[31]	11-16-31	15	.....	
U. S. Gypsum com.	11-17-31	27	28	40c qu. Dec. 31
U. S. Gypsum pfd.	11-17-31	118	120	1.75 qu. Dec. 31
Wabash P. C.[21]	11-16-31	.....	21	
Warner Co. com.[16]	11-13-31	14	16	25c qu. Oct. 15
Warner Co. 1st 7% pfd.[16]	11-13-31	90	95	1.75 qu. Oct. 1
Warner Co. 1st 6's 1944 ex.w.	11-17-31	52¾	.....	
Whitehall Cem. Mfg. com.[30]	11-13-31	60	.....	
Whitehall Cem. Mfg. pfd.[30]	11-13-31	40	.....	
Wisconsin L. & C. 1st 6's[15]	11-18-31	No market		
Wolverine P. C. com.	11-17-31	1½	4	15c qu. Nov. 15
Yosemite P. C., A com.[9]	11-12-31	1	1½	

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler, Beadling & Co., Youngstown, Ohio. [5]Smith, Camp & Riley, San Francisco, Calif. [6]Frederick H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central-Republic Bank & Trust Co., Chicago. [16]J. S. Wilson, Jr., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hewitt, Ladin & Co., New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simonds & Co., Inc., Detroit, Mich. [22]Peoples-Pittsburgh Trust Co., Pittsburgh, Penn. [23]Howard R. Taylor & Co., Baltimore. [24]Richards & Co., Philadelphia, Penn. [25]Hincks Bros. & Co., Bridgeport, Conn. [26]Bank of Republic, Chicago, Ill. [27]National City Co., Chicago, Ill. [28]Chicago Trust Co., Chicago, Ill. [29]Boettcher-Newton & Co., Denver. [30]Hanson and Hanson, New York. [31]S. F. Holzinger & Co., Milwaukee, Wis. [32]Tobey and Kirk, New York. [33]Steiner, Rouse and Co., New York. [34]Jones, Heward & Co., Montreal, Que. [35]Tenney, Williams & Co., Los Angeles, Calif. [36]Stein Bros. & Boyce, Baltimore, Md. [37]Wise, Hobbs & Arnold, Boston. [38]E. W. Hays & Co., Louisville, Ky. [39]Blythe Witter & Co., Chicago, Ill. [40]Martin Judge Co., San Francisco, Calif. [41]A. J. Pattison Jr. & Co. Ltd., Toronto, Canada. [42]Nesbitt, Thomson & Co., Montreal. [44]E. H. Rollins, Chicago. [45]Dunlap, Wakefield & Co., Louisville, Ky. [46]Dan Powell & Co., Los Angeles.

Estimated Current Earnings of Canada Cement

FOR the fiscal year ending November 30, 1931, Canada Cement Co. will show the preferred dividend safely earned, and a balance applicable to the common stock. Preferred dividends this year will approximate the $1,363,732 so required in 1930.

The company handling approximately four-fifths of the Dominion's cement business, would benefit greatly for a considerable period from work in the near future on the huge St. Lawrence seaway project as now contemplated, and being discussed by officials of Canada and the United States.

Business now in sight indicates another profitable period in the 1931 fiscal year. Unemployment relief work, which is planned on a comprehensive scale all over the Dominion, will result in considerable business for the company. The all-Canada highway, which is likely to become a fact before long, would require 38,000,000 bbl. of cement. Important building projects, including construction of a new postoffice at Montreal and other public and private buildings, are planned for the next year. Recent order suspending work on the new Canadian National terminal at Montreal, which work, now only partly completed, called for a total of 350,000 bags of cement, is stated to be only a temporary halt on this work.

Report of company for the fiscal year ended November 30, 1930, showed net income, after all charges including interest and provision for depreciation, reserves, etc., of $1,566,014, equal after preferred dividends to 34 c. a share on 600,000 shares of no-par common.—*Wall Street Journal* (New York City).

Holliston Trap Rock Co. Statement

THE ANNUAL balance sheet of the Holliston Trap Rock Co., Holliston, Mass., as of December 31, 1930, is reported as follows:

ASSETS

Real estate	$ 10,568
Machinery	159,153
Merchandise	25,702
Cash	1,291
Accounts receivable, customers	4,987
Advances received	19,733
Notes receivable	181
Deferred expenses	4,496
Bond discount and expense	6,555
Certificates of deposit	6.050
Furniture and fixtures	574
Vehicles	9,831
Plant construction	51,528
Organization expense	39,792
Rock reserve as appraised	599,910
Total	$940,351

LIABILITIES

Capital stock	$192,100
Accounts payable	17,586
Notes and acceptances payable	143,244
Subscribers' accounts	162
Bonds payable	1,100
Reserve for depreciation	37,639
Accrued expenses	972
5000 shares no par stock	62,500
Surplus	7,450
Capital surplus	477,598
Total	$940,351

Estimated Current Earnings of U. S. Gypsum

THE U. S. Gypsum Co., Chicago, Ill., which issues only annual and semi-annual reports, for first nine months of this year, is understood to have earned net profit of about $2,850,000, which, after preferred dividend requirements on 78,417 shares of 7% preferred stock, is equal to slightly over $2 a share (par $20) on the 1,216,956 shares of common stock outstanding on June 30, last.

Since the company reported net profit of $2,241,560, equivalent after preferred stock dividends to $1.62 a share on common in the six months to June 30, 1931, its third quarter net profit on that basis would be approximately $609,000 or about 40 c. a share. These earnings have been realized during a period when the company's operations averaged less than 30% of capacity. The company is understood to be currently operating at about 20% of capacity.

In addition to expanding its property, through acquiring small companies which produce allied lines, the company has been stressing its research activities this year with a view toward developing new products and devising new commercial uses for its products. If some extensive use can be found for the company's products outside the building and construction field, part of the present seasonal variation in its business could probably be ironed out. It is understood that the company has made considerable progress in this respect.—*Wall Street Journal* (New York City).

Connecticut Quarries Co. Statement

THE CONNECTICUT QUARRIES CO., New Haven, Conn., is reported to have made the following financial statement, for the year ending December 31, 1930:

ASSETS

Real estate	$ 248,264
Tools and equipment	1,031,524
Merchandise	11,967
Cash	76,686
Accounts receivable	89,177
Securities	49,491
Notes receivable	16,400
Leaseholds	24,400
Prepaid charges	3,300
Furniture, fixtures and supplies	3,439
Vehicles	24,116
Total	$1,578,764

LIABILITIES

Capital	$ 789,500
Mortgages	117,500
Accounts payable	36,069
Reserves	319,290
Surplus	316,405
Total	$1,578,764

Recent Dividends Announced

Kentucky Rock Asphalt pfd. (qu.)	1.75,	Dec. 1
Lehigh Portland Cement pfd. (qu.)	1.75,	Jan. 2
United States Gypsum com. (qu.)	.40,	Dec. 31
United States Gypsum pfd. (qu.)	1.75,	Dec. 31

President of International Cement Corp. Comments on Cement Situation

A RECENT ISSUE of the *Wall Street Journal* (New York City) carried a report of an interview with Holgar Struckmann, president of the International Cement Corp., as follows:

"Returning from a three months business trip to Europe and South America, Holgar Struckmann, president of International Cement Corp., stated that the cement industry was giving indications of having turned the corner toward definite improvement, and the outlook for 1932 was much improved.

"'The price of cement,' he said 'is extremely low and any change should mean better prices.' Mr. Struckmann, who has been in South America surveying the progress of the company's new plant being constructed at Rio de Janeiro, said that the unit's completion was scheduled for next year and that it would have an annual capacity of about 1,000,000 bbl.

"'The future of International Cement in South America is so promising,' he said, 'that the company's income from this business alone should be ultimately sufficient to cover its dividend requirements. We are firmly established in Uruguay and the Argentine. As soon as the plant at Rio is completed we will commence construction of another unit at Sao Paulo. After many years effort International has uncovered one of the finest limestone deposits in South America, which will enable the activities of our subsidiary companies to continue to develop uninterruptedly.'

Making Money on Foreign Business

"Mr. Struckmann pointed out that the company's foreign business, with the exception of Cuba, was being operated at a profit, although earnings are running below a year ago. Domestic business, he said, considering the general depression, was holding up well. He estimated net income for the current year would amount to approximately $2,250,000 as compared with $4,539,509, or $7.14 a common share, in 1930. Although there is a possibility that the $4 common dividend might not be covered for the year, he said the final figure should not fall far below it. The company has no preferred stock. Outstanding bonds at the end of 1930 totaled $17,995,500.

"Mr. Struckmann further stated that he looked for many important developments in the industry in the near future.

"'It is my opinion,' he said 'that as the result of the current depression the cement industry will witness consolidations of the stronger units and the elimination of the weaker ones. This is necessary to bring about greater economy in production and distribution. In any move in that direction International Cement will take an important part.'

"Estimated net profit, after all charges and

taxes, of $2,250,000 is equivalent to around $3.50 a share on the outstanding 636,171 shares of International Cement common stock. As of the close of last December the company had outstanding $17,995,000 of 20-year 5% convertible debentures, entailing annual interest charges of $899,750. These debentures are currently selling at 75.

"For the nine months ended September 30, last, net profit, after charges and taxes, amounted to $1,532,107, equal to $2.41 a share on the outstanding 636,171 common shares. In the corresponding period a year previous, net totaled $3,446,768, or $5.44 a share on 633,452 shares.

In Strategic Position in Industry

"International Cement occupies a strategic position in the cement industry—the geographical location of its entire production being an important factor in enabling the corporation to meet intense foreign and domestic competition. In addition to its domestic business, the company is firmly entrenched in Argentina, Uruguay and Cuba. During 1930, raw material deposits were acquired near Rio de Janeiro and Sao Paulo, Brazil, as the result of a lengthy quest for a suitable limestone deposit in that country. These deposits were core drilled and thoroughly prospected and were found to contain large quantities of raw material at each location for the manufacture of a high-grade portland cement.

"In Argentina, Uruguay and Cuba the company has erected modern mills which have enabled it to cut retail prices sharply in the several countries while still retaining a fair margin of profit.

"The United States plants of the company are well scattered throughout the country and in nearly all cases are close to their main markets, thereby obviating long freight hauls. This, in conjunction with high operating efficiency, reflecting the high degree of modernization of plants effected out of the $20,000,000 set aside for depreciation and depletion over the past 11 years, has placed the company in the front rank of low cost producers. During the current year, in the face of the keenest competition ever experienced in the industry as well as a sharp contraction in demand, the company has more than held its own in the amount of cement sold."

August Feldspar Production in Canada

CANADIAN feldspar production during August was slightly above the July total, according to a report just issued by the Dominion Bureau of Statistics at Ottawa. During August, 2,160 tons were produced as compared with 2,105 tons in July and 1,622 tons in August, 1930.

Imports of ground feldspar into Canada amounted to 33 tons valued at $448; in July, 162 tons, worth $2,812 were imported.

International Agricultural Corp. Statement

THE International Agricultural Corp., one of the principal producers of phosphate rock, reports for the years ended June 30:

CONSOLIDATED INCOME ACCOUNT

	1931	1930
Gross profit	$2,850,125	$4,382,682
Expenses	1,897,492	1,836,925
Depreciation and depletion	532,363	604,323
Operating profit	420,270	1,941,434
Other income	84,552	121,453
Total income	504,822	2,062,887
Interest	448,498	469,713
Profit	56,324	1,593,174
Profit on bonds purchased	4,353	68,002
Profit	60,677	1,661,176
Federal taxes	.....	135,000
Net profit	60,677	1,526,176
Preferred dividends	525,000	525,000
Surplus	(d) $464,323	$1,001,176
Times interest earned	1.13	4.39
Earned per share, common	nil	$1.83
Number of common shares,	450,000.	

CONSOLIDATED BALANCE SHEET

Assets:	1931	1930
Property account	$24,751,479	$24,087,940
Current assets:		
Cash	1,330,992	1,629,074
Accounts and notes receivable	5,046,886	5,522,842
Inventories	3,289,297	2,504,887
Due from subsidiaries	944,634	1,479,999
Investments	646,886	645,845
Unmined phosphate property	64,837	56,874
Deferred charges	179,488	201,142
Sinking fund cash	17	786
Total	$36,254,516	$36,129,389
Liabilities:		
Preferred stock	$10,000,000	$10,000,000
*Common stock	2,250,000	2,250,000
Bonds	7,112,100	7,444,600
Current liabilities:		
Accounts payable	285,428	221,226
Notes payable	1,000,000	.....
Accrued interest, etc.	173,882	242,565
Federal taxes	.....	135,000
Special reserve	5,466,430	5,404,998
†Excess assets	9,966,676	10,431,000
Total	$36,254,516	$36,129,389
Current assets	$9,667,175	$9,656,803
Current liabilities	1,459,310	598,791
Working capital	$8,207,865	$9,058,012

*Represented by 450,000 no-par shares. †Excess assets over required declared capital.

Alpha Cement Cuts Capital Stock

THE Alpha Portland Cement Co., Easton, Penn., a New Jersey corporation, was authorized November 13 by George W. Sharp, secretary of state, to decrease its capital stock from $26,134,500 to $20,486,000. —*Charleston* (W. Va.) *Gazette.*

New England Mica Co.

THE New England Mica Co., Waltham, Mass., reports its balance sheet as of December 31, 1930:

Real estate	$137,821
Machinery	78,415
Merchandise	26,578
Cash	13,429
Accounts receivable	20,834
Notes receivable	14,422
Deferred charges	4,847
Cash value, life insurance	8,766
Furniture, fixtures, supplies	558
Rights and leases	3,000
Trademarks and patent rights	27,881
Total	$336,551
Capital	$149,500
Mortgages	2,500
Accounts payable	18,908
Notes payable	20,000
Funded debt	10,000
Surplus	36,763
4,944 shares no par value	98,880
Total	$336,551

Cement Markets of Jamaica

THERE has been a complete change in the sources of cement for Jamaica since 1919, when the United States furnished 90% of the total. During the last five years imports of cement from that country have been practically eliminated, and 77% of the total in 1930 came from the United Kingdom. The change is attributed entirely to the inability of the United States in recent years, to compete on this market as there appears to be no local objection to the quality of the American product.

There is no local manufacture of cement, and it is claimed that investigation of local conditions indicates that a domestic cement industry would not be profitable. It is estimated that 85% of the cement consumed in Jamaica is gray portland; 10% of the quick-hardening variety, and less than 5% is white cement.

The Jamaican government is stated to be the largest purchaser of cement, consuming about 44,000 bbl. a year. The large hardware stores are important purchasers, and sell to contractors and builders. No middlemen handle cement. Local stocks are carried chiefly by the government and the hardware firms. Manufacturer's agency has proved the most successful method of marketing cement in Jamaica.

English cement houses have an established business and are not compelled to resort to any sales effort worthy of mention. The Continental exporters obtain their business on the ground of price. A Canadian competitor on this market employs newspaper advertising.

The preferential tariff applies to imports from the United Kingdom and Canada while the United States and Continental countries pay the general tariff.

Ability of the American manufacturer to re-enter the Jamaican market will depend largely on the degree of disparity between the two exchanges and the stabilization of the pound sterling, to be expected in due course.

In addition to the above special circular No. 11 of the Minerals division of the Bureau of Foreign and Domestic Commerce gives information on prices, imports, customs, charges and sales agencies.

To Open Phosphate Mine in Montana

THE Pacific Phosphate and Chemical Co., Portland, Ore., of which Allan Swain is president, plans to open a phosphate deposit on a quarter section of land just obtained near Elliston, Mont. A pit mine will be started at once to produce rock for fertilizer and fluxing. The company will serve the needs of Pacific northwest markets first and will later turn its attention to wider distribution. The company is now handling 10 carloads of phosphate through its plant.

New England Crushed Stone Association Discusses Many Local Problems

ON FRIDAY, November 6, the New England Crushed Stone Association held its fall meeting at the Parker House in Boston, Mass., and the meeting was unusually well attended. Many subjects of both local and national interest were discussed, including the desirability of employing a competent attorney secretary whose special business would be to keep an eye on proposed legislation in Massachusetts which might affect the welfare of the crushed stone industry. The discussion of this matter was led by Otho M. Graves, president of the General Crushed Stone Co., which has a Massachusetts plant at Winchester, a suburb of Boston.

W. E. Hilliard, general manager of the New Haven Trap Rock Co., New Haven, Conn., and chairman of the committee of the National Crushed Stone Association on uniform cost accounting, spoke in favor of the adoption of uniform cost accounting and suggested that all the member companies bring with them to the Pittsburgh convention of the industry in January copies of their record sheets, cost data, etc., that the committee might have a full and complete discussion.

Bernard McKinney, West Roxbury Trap Rock Co., West Roxbury, Mass., president of the New England association, appointed a committee of five to investigate and report on the advisability of forming a sales corporation of the Massachusetts companies in an effort to establish better competitive conditions. This committee consists of H. Robinson, Harold Bronson, W. E. Hilliard (chairman), M. McDonough and Theodore Cook.

Another subject discussed was the disposal of the in-between sizes of crushed stone, that is, the sizes between 2-in. and pea size.

The discussion was led by A. L. Bratt, testing engineer of the Massachusetts Bureau of Public Works. His talk was brief but to the point and suggested that steps be taken to reach the heads of the various highway departments in regard to the advisability of using these smaller sizes of stone for "mixed in place" bituminous road construction. As a result of his suggestion, a committee was appointed consisting of E. T. Perry, Theodore Cook and Lawrence Robinson to gather data on the advantages of crushed stone for this type of construction and to present such data to the various state highway departments.

A. T. Goldbeck, director of the bureau of engineering of the National Crushed Stone Association, spoke briefly of the work he is doing at Washington and called the attention of the members particularly to his new Bulletin No. 7, giving the relative results on beam tests of concrete. The New England association decided to order 200 or more of these bulletins for distribution among various New England highway departments, contractors, etc. Mr. Goldbeck also emphasized the possibilities of making real use of the National Association's "Useful Information" bulletins which are distributed regularly to active members, and asked for the cooperation of all active members in presenting suggestions, criticisms and problems for him to cover in these bulletins.

Albert L. Worthen, vice-president of the Connecticut Quarries Co., New Haven, Conn., and president of the National Crushed Stone Association, spoke on general business conditions in New England, comparing them very favorably with conditions throughout the country at large which he had become acquainted with through his duties as chief executive of the National Association. He seemed quite positive that the New England producers were in a more fortunate position even though their tonnages were low, for the producers here have been wise enough to maintain prices in keeping with the actual costs of production.

A letter was read from J. R. Boyd, secretary of the National Crushed Stone Association, who was unable to be present, suggesting that the New England Crushed Stone Association hold a dinner meeting in connection with the Pittsburgh convention of the National Association in January. His suggestion was adopted at the meeting.

Registration

A. L. Bratt, testing engineer, Massachusetts Bureau of Public Works.
Connecticut Quarries Co., New Haven, Conn., A. L. Worthen.
General Crushed Stone Co., Easton, Penn., Otho M. Graves.
Holliston Trap Rock Co., Holliston, Mass., L. A. Eames.
Lynn Sand and Stone Co., Swampscott, Mass., Theodore Cook, H. W. Kummel and C. H. Latham.
Malden Crushed Stone Co., Malden, Mass., M. McDonough.
Massachusetts Broken Stone Co., Stony Brook, Mass., E. D. Burkhardt, Harry Robinson, Lawrence Robinson and Arthur J. Wellington.
Metropolitan Crushed Stone Co., Boston, Mass., Garrett Keefe.
National Crushed Stone Association, Washington, D. C., A. T. Goldbeck.
New Haven Trap Rock Co., New Haven, Conn., W. E. Hilliard and E. T. Perry.
Old Colony Crushed Stone Co., Quincy, Mass., E. R. Atwood.
D. M. Pallatto, Dracut, Mass.
Pit and Quarry, Chicago, Ill., W. E. Trauffer.
ROCK PRODUCTS, Chicago, Ill., Walter B. Lenhart.
Rowe Contracting Co., Malden, Mass., H. R. Bronson.
West Roxbury Trap Rock Co., West Roxbury, Mass., Frank Long and Bernard McKinney.

Pennsylvania Sulphur Deposit

ANNOUNCEMENT of the discovery by Dr. A. P. Honess, professor of mineralogy at Penn State College, of deposits of pure sulphur in limestone of Centre county, Pennsylvania, was recently made. Native sulphur, according to Dr. Honess, has also been reported from Carbon, Chester and Montgomery counties.

"This discovery holds no commercial significance," Dr. Honess said, "but as a matter of scientific importance it is of considerable value."—*Milton* (Penn.) *Standard.*

International Acetylene Association Meets

THE MOST comprehensive discussion ever given of methods for testing oxy-acetylene welded joints was one feature of the thirty-second annual convention of the International Acetylene Association held at the Congress Hotel, Chicago, Ill., November 11, 12 and 13.

At the weld-test session, November 11 at 8:15 p. m., Prof. H. L. Whittemore of the United States Bureau of Standards spoke on the importance of tests to welders and to users and makers of welded products. There was a dramatized demonstratiaon of visual and stethoscopic tests; hammer, bending, tension and hardness tests; Invisible-ray tests; specific gravity, compression, and internal pressure tests.

Manufacture of Portland Cement from Marl

THE engineering experiment station of the University of Minnesota has published bulletin No. 4 by Raymond E. Kirk, assistant professor of chemistry, on the manufacture of portland cement from marl.

This 98 page illustrated bulletin describes the use of marl as a raw material and the manner in which it is handled at a number of plants.

It also covers the investigation of marl deposits and lists a number of deposits in Minnesota which might be utilized for this purpose.

Handbook for Prospectors

A SECOND edition of the Handbook for Prospectors by M. W. von Bernewitz has been published by McGraw-Hill Book Co., New York, N. Y. This 260-page book gives very complete information regarding the methods and equipment used in various kinds of prospecting.

Chapters are included on mineralogy, geology, the occurrence of ores, methods of sampling, testing and developing prospects, the laws pertaining to mining, etc. A new chapter has been added on geophysical prospecting and a glossary of mining terms is included.

Fix Duty on Lime to Canada

THE VALUE for duty purposes of slaked or hydrated lime has been fixed by the Minister of National Revenue of Canada at $8.88 a ton, according to a bulletin issued by the department. This value applies at the point of production.

Goods shipped on consignment without sale prior to shipment, so as to evade the payment of special duty, will be subject to that special duty, the bulletin says.

Traffic and Transportation

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week of November 14:

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

23759. **Sand and gravel** (See Note 3), from Scotia, N. Y., to Petersburgh, N. Y. Present rate, $1.20 per net ton; proposed, 95c. Reason—To permit carriers to obtain a haul on traffic which would otherwise move by barge or truck.

TRUNK LINE ASSOCIATION DOCKET

Sup. 1 to 27852. **Sand, blast, building, engine, glass, quartz, foundry, silex and silica,** carloads (See Note 2), from Berkeley Springs, Great Cacapon and Hancock, W. Va., to Oshawa and Kingston, Ont., 24½c per 100 lb.

Sup. 1 to 27853. **Sand, blast, building, engine, glass, quartz, foundry, silex and silica,** carloads (See Note 2), from Berkeley Springs, Great Cacapon and Hancock, W. Va., to Peterboro, Ont., 24½c per 100 lb.

27938. **Ground limestone,** carloads, minimum weight 50,000 lb., from York, Penn., to Nemours, W. Va., 21½c per 100 lb. Present rate, 43c per 100 lb., sixth class. Reason—Proposed rate is fairly comparable with rate from York to Abingdon, Va.

27944. **Sand and gravel,** carloads (See Note 2), from Kenvil, N. J., to Allentown, Penn., 90c; and from Springtown, N. J., to Bethlehem and Allentown, Penn., 70c per net ton. (See Note 5.)

27947. **Sand,** other than blast, foundry, engine, molding, fire, quartz, silica and silex, carloads (See Note 2), from Kenvil and Hopatcong Junction, N. J., to C. R. R. of N. J. stations, Hometown, Sandy Run Junction, Tunnel, Nanticoke, Plains Junction, Taylor and Scranton, Penn., and various, rates ranging from $1.20 to $1.40 per net ton. Reason—Proposed rates are comparable with rates from Palmerton, Wyoanna, Penn., etc.

27881, Sup. 1. (A) **Sand,** in open top cars, carloads, (B) **sand,** in box cars or closed equipment (See Note 2), from Pinewald, Quail Run, N. J., to Alexandria, Va.; (A) $2.55, and (B) $2.80 per net ton.

27961. **Gravel and sand** (other than blast, core, engine, fire, foundry, glass, molding, quartz, silex or silica), in straight or mixed carloads, in open top equipment (See Note 2), from Machias, N. Y., to Varysburg, N. Y., 75c per net ton. Present rate, 83c. (See Note 4.)

27970. **Crushed stone, sand, gravel and slag,** as described in B. R. & P. Ry. Tariff I. C. C. 8316, carloads, minimum weight as contained therein, from Buffalo, N. Y., to (rates in c. per 2,000 lb.):

To points in Penn.: (See Note 5)

	Prop.		Prop.
Lanes Mills	130	Homer City	160
Sykesville	140	Anita	150
Marion Center	150	Valier	150

Sup. 2 to 27703. **Sand, viz., blast, common, engine, glass, molding, quartz, silex and silica,** carloads (See Note 2), and **ground flint,** carloads, minimum weight 40,000 lb., to Lisbon, O., from Hancock, Great Cacapon and Berkeley Springs, W. Va., 12c per 100 lb., and from Gore, Va., $2.55 per net ton.

27978. **Ground limestone,** carloads, minimum weight 50,000 lb., from Stover, Penn.

To	Prop.
Hoboken City to Little Falls, N. J.	15½
Mountain View to Fox Hill, N. J.	15½
Kearny Jct. to Newark, N. J.	15½
Roseville Avenue to Watsessing, N. J.	15½
Bloomfield to Gladstone, N. J.	15½
Chatham to Madison, N. J.	15½
Convent to Netcong, N. J.	15½
Cranberry Lake to Franklin, N. J.	19
Waterloo to Delaware, N. J.	15½
Conklin to Lowman, N. Y.	16
Elmira to Black Rock, N. Y.	15½
Chenango Bridge to McGraw, N. Y.	16
Solon to Cincinnatus, N. Y.	17½
Homer to Solvay, N. Y.	16
Lakeside to Oswego, N. Y.	19
Willards to Richfield Jct., N. Y.	16
Bridgewater to Richfield Springs, N. Y.	19
Claysville to Utica, N. Y.	16

Proposed rates in cents per 100 lb.

Reason—Proposed rates are same as in effect from Bellefonte, Penn.

27987. To cancel commodity rate of 70c per 2000 lb. on **crushed stone,** carloads, from Harpers Ferry, W. Va., to Winchester, Va., classification basis to apply. Reason—Investigation develops that no traffic has moved for some time and no prospect of future movement, therefore rate is obsolete.

27994. **Sand, common or building** (not blast, engine, fire, foundry, glass, molding or silica sand), and **gravel,** carloads (See Note 2), from Clarence, N. Y., to Akron, N. Y., 40c per net ton. Present rate, 55c. (See Note 4.)

28006. **Sand** (except blast, engine, foundry, glass, molding, silica) and **gravel,** carloads (See Note 2), from Haven, N. Y., to Cadosia, Tylers, Fish's Eddy, East Branch and Trout Brook, N. Y., 91c per net ton. Present rate, $1. (See Note 5.)

CENTRAL FREIGHT ASSOCIATION DOCKET

29653. To establish on **stone, crushed,** in bulk, in open top cars, carloads, minimum weight from Bloomville, O., to Bucyrus and Hines, O., rate of 50c per net ton. Present rate 60c.

29687. To establish on **crushed stone,** in open top cars, carloads, from Bellevue, O., to New Cumberland and Somerdale, O., 115c per net ton. Present—120c.

29698. To establish on **sand and gravel,** carloads, in open top equipment, from Massillon, O., to Fredericksburg, O., rate of 65c per net ton to expire six months from effective date. Present—70c.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Note 4—Reason—To meet motor truck competition.

Note 5—Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

29709. To establish on **molding sand,** carloads, shipped in open top equipment, from McKees Rocks, Penn., to Braddock and Bessemer, Penn., rate of 60c per net ton. Present—80c.

29700. To establish on **limestone, raw dolomite,** in box cars, carloads, from Carey, O., Clarion, Penn., rate of 225c per net ton. Present, 450c.

29705. To establish on **burnt or refuse foundry sand,** carloads, minimum weight 60,000 lb., from Buffalo and Black Rock, N. Y., to Toronto, Ont., rate of 180c per net ton. Present, 18½c (6th class).

29717. To establish on **stone, crushed,** also **limestone, agricultural** (not ground or pulverized), in bulk, in open top cars only, carloads, from Keeport, Ind., to Warsaw and Milford Jct., Ind., rate of 80c and 85c, respectively. Route—Wab. Ry.-Peru, Ind., Winona R. R. Present, 90c and 95c per net ton, respectively.

29716. To establish on **crushed stone, crushed stone screenings** and **agricultural limestone** (not ground or pulverized), in bulk, in open top cars, carloads, from Whitehouse, O., to Mt. Pleasant, Mich., rate of 142c per net ton. Routing—Wab. Ry., Toledo, O., Ann Arbor R. R. Present, 145c.

29720. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) **and gravel,** carloads, from Ashtabula and Ashtabula Harbor, O., to N. Y. C. R. R. stations, viz., Madison, Conneaut, O., 60c; North Girard, Penn., Swanville, Osgood, Amasa, O., Williamsfield, Wick, O., 70c; Erie, Stoneboro, Sandy Lake, Penn., Tyrell and Hartford, O., 80c; Andover and Mann, O., 65c; Franklin, Farrell, Sharon, Sharpsville, Wheatland, West Middlesex, Penn., and Bentley, O., 90c; Stanhope and York, Penn., 75c; Doughton and Hubbard, O., 85c per net ton. Present rates: To Madison, Conneaut, Andover O., 70c; North Girard, Penn., and Williamsfield, O., 80c; Swanville, Erie, Penn., Stanhope, Tyrell, Doughton, Mann, Wick, York, Hartford and Hubbard, O., 90c; Osgood, Amasa, Stoneboro, Sandy Lake, Franklin, Farrell, Sharon, Sharpsville, Wheatland, West Middlesex, Penn., and Bentley, O., 100c per net ton.

29727. To establish on **agricultural limestone,** carloads, minimum weight 50,000 lb., from West Columbus, O., to Buffalo, N. Y., rate of 227c per net ton. Present rate, 252c.

29744. To establish on **agricultural limestone; crushed stone; stone, quarry scrap; stone, rip rap; stone screenings and stone tailings,** in bulk, in open cars, carloads, from Greencastle, Ind., to Madison, Ind., rate of 96c per net ton. Present rate, 105c.

29753. To restrict application of rate of $1.61 per ton, published in Item 5592 of C. F. A. L. Tariff 237-J, on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) or **gravel,** from Evansville, Ind., and points taking same rates to East St. Louis, Ill., by providing that said rate will not apply to upper east bank Mississippi River crossings as shown on page 35 of above mentioned tariff.

29756. To amend origin territory of Item 11640, C. F. A. L. Tariff 218-G, publishing rates on **slag, slate, stone or gravel, crushed or ground,** carloads, from stations in Rate Group No. 10,000 (Chicago, Ill., etc.), to points east of the western termini of eastern trunk line territory, on basis of 31½c to New York, by adding thereto stations in Rate Group 10,005 (Milwaukee, Wis., etc.), on the same basis.

29761. To establish on **agricultural limestone,** in packages or in bulk, in bags or boxes, carloads, minimum weight 80,000 lb., except when marked capacity of car is less, in which case the marked capacity will apply, but not less than 60,000 lb., from Carey, O., to stations in Michigan (representative points shown in Exhibit A), rates as shown in Exhibit A attached. Present rate, 60% of sixth class.

29766. To establish on **sand and gravel** (except blast, core, engine or polishing, loam, molding or silica), carloads, from Narlo, O., to points in Ohio, viz. (representative points), South Lorain, Berlin Heights, Colby, McComb, Sandusky, Findlay, Lima, Soldiers Home, Pontiac, New Haven, Ottawa, Deshler, Bloomdale, Ransoms, Watson, Carey, McVittys, Kenton, Toledo, Pemberville, Alveda, Marion, Napoleon, Prentiss, Cairo, Williston, Oak Harbor, Norwalk, Hartland and Wellington, O., rates of 90, 80, 60, 75, 85, 70, 90, 80, 80, 85, 85, 80, 80, 80, 80, 80, 95, 95, 85, 80, 80, 85, 95, 85, 90, 90, 85, 80, 80 and 85c per net ton, respectively. Present rates, sixth class.

SOUTHERN FREIGHT ASSOCIATION DOCKET

55828. **Artificial bituminous rock, crushed or broken,** carloads, and bituminous composition or compounds; sand, slag or stone base, carload, Birmingham, Ala., and group points to points in southern territory. It is proposed to establish rates on artificial bituminous rock, carload, and on bituminous composition or compound, from origins in the Birmingham district to all points in S. F. A. territory, including points in the Peninsula of Florida, on basis of the same scales on the rock as now in effect on natural bituminous rock from origins in Kentucky such as Big Clifty, Bowling Green, etc. On the bituminous composition or compound, which is also a manufactured product, and is used in connection with the artificial rock as a surfacing material, it is proposed to establish rates made 15% of current first class rates. There are not specific commodity rates in effect at the present time.

55830. Revision of rates on **sand, molding,** between points in Southern territory. It is proposed to restrict the rates in Agent Glenn's Tariff No. 88-A, I. C. C. No. A-655, so as not to apply on molding sand, to cancel other commodity rates on molding sand between points in Southern territory and establish rates in lieu thereof based 120% of the common sand rates (Docket 17517 rates). Rates from points north of the Ohio river to Southern points which have been published on basis of combination, using either the common sand or the molding sand rates south of the Ohio river, are to be revised to reflect such new factors as may be adopted as result of revision south of the Ohio river.

ILLINOIS FREIGHT ASSOCIATION DOCKET

2051-QQ. **Stone, crushed,** carloads (See Note 2), but not less than 40,000 lb., from Luverne, Minn., to Sibley, Ia. Present rate, 5½c per 100 lb.; proposed, 3½c.

Granted Right to Intervene in Silica Sand Rate Case

AT A GENERAL SESSION of the Interstate Commerce Commission, held November 4, on 22907, Illinois Silica Sand Traffic Bureau, vs. Akron, Canton and Youngstown Railway Co., et al.; 23111, Pennsylvania Glass Sand Corp., vs. Akron, Canton and Youngstown Railway Co., et al.; and 23111, Pennsylvania Glass Sand Corp., vs. Akron, Canton and Youngstown Railway Co., et al., the following order permitting intervention was issued:

"Upon consideration of the record in the above-entitled proceedings and application filed on behalf of United States Potters' Association; it is ordered, that the said United States Potters Association be, and it is hereby, permitted to intervene and be treated as a party hereto, for the purpose of filing exceptions to the examiner's proposed report and brief in support of exceptions and being heard on oral argument, if oral argument is had and participating in any further proceedings herein."

Postpone Hearing on Ohio Freight Rates

THE FIGHT of Sandusky, Ohio, for a fair break in freight rates on road materials scored a point before the Interstate Commerce Commission when the Kelley Island Lime and Transport Co. was permitted to intervene in the complaint of many such companies against railroads in Ohio.

A hearing set for November 4 at Columbus before an examiner of the commission has been postponed for 30 days or more to permit Sandusky and other interests to prepare printed petitions for the commission's consideration.—*Sandusky* (Ohio) *Register.*

Orders Proposed Texas Cement Rate Revisions Suspended

BY AN ORDER entered in Docket 3649, the Interstate Commerce Commission has suspended from November 9, 1931, until June 9, 1932, the operation of certain schedules proposing to revise the rates on cement, in carloads, from Harrys and Eagle Ford, Tex. (points within the Dallas, Tex., switching limits) to numerous destinations in Arkansas and Louisiana, to reflect the distances from Dallas proper, which would result generally in reductions.

Order Freight Cut on Ohio Fluxing Stone

A REDUCTION from $1.01 to 90 c. a ton on carload lots of fluxing stone hauled between Painesville and Fairport Harbor and Lowellville was ordered by the Ohio state utilities commission recently.

The original rate had been attacked as excessive.—*Cleveland* (Ohio) *Plain Dealer.*

Attacks Eastern Rates on Limestone

IN A FORMAL COMPLAINT filed with the Interstate Commerce Commission the M. J. Grove Lime Co., Lime Kiln, Md., has attacked the freight rates on crude, fluxing, foundry or furnace limestone, in carloads, from Stephens City, Va., to destinations in Virginia, Maryland, Pennsylvania, West Virginia, Ohio and Delaware.

The complaint points out that rates from Stephens City to representative destinations are considerably higher than rates from Thomasville, Williamson, Penn., Engle and Martinsburg, W. Va., and other nearby producing points.

These higher rates, the complaint alleges, are unduly prejudicial to the Grove company. The commission is asked to establish just and reasonable rates for the future.

Claims Unfair Rate on Empty Cement Bags

THE Dewey Portland Cement Co., Kansas City, Mo., has filed a complaint with the Interstate Commerce Commission against alleged unreasonable freight rates on empty cloth bag-containers for cement.

The particular shipments complained of were one of 69 bundles of empty bags and one of 225 bundles from Minnesota to Davenport.

With an average actual weight of 40 lb. a bundle, the Davenport company asserts that the freight rates were based on an arbitrarily assumed weight of 60 lb. a bundle.

The company asks reparation of $70.15 plus interest.—*Davenport* (Ia.) *Times.*

Seek Increased Intrastate Gravel Rates in Mississippi

A PETITION of railroads seeking increased intrastate freight rates on gravel has been continued to the November meeting by the Mississippi railroad commission.

Under the rates asked by railroads, the intrastate rate would be placed in line with the interstate rate, which, opponents claim, will add $15,000,000 to the cost of constructing roads in Mississippi.

Chief among the opponents to the change in rates is the state highway commission.—*Hattiesburg* (Miss.) *American.*

To Present Need for Crushed Marble and Limestone Rates in Alabama

NEEDS of Alabama for the establishment of a system of rates on crushed marble and crushed limestone as well as ground marble and ground limestone were to be presented to the interstate commerce commission November 9 by C. E. Jones, manager of the Birmingham Traffic Association.—*Birmingham* (Ala.) *Post.*

Trunk Lines Protest South Carolina Sand Rate Ruling

PROTESTING that the present status of the case on sand, clay and gravel rates deprives them of more than $30,000 in revenue, the Southern Atlantic Coast Line, Seaboard and Charleston and Western Carolina railroads filed complaint for relief in the Richland court of common pleas recently.

The main lines ask that the court review the action and authority of the state railroad commission on the division of rates between main and short railroad lines.

They complain that a recent order of the commission gives short lines which operate in the vicinity of Hampton, Branchville and other points in the lower state an undue share of the revenue in proportion to their distance of the haul.

The court is asked to reverse the order of the railroad commission and indicate in a decree what action it considers the commission authorized to take in such affairs.—*Charleston* (S. C.) *News.*

Roads Petition I. C. C. for Relief from Louisiana Commission Ruling

APPLICATION of the Illinois Central and other railroads for increase in sand and gravel rates east of the Mississippi river, has been put before the Interstate Commerce Commission, regardless of the intrastate character of the request, because of what the railroads claim has been the failure of the Louisiana Public Service Commission to set a hearing in the matter.

The requested increases would involve about $100,000 to $200,000 annually on sand and gravel used largely by the state and various municipalities for road and street construction, it has been estimated.—*Alexandria* (La.) *Town Talk.*

Petitions for Rehearing on Asphaltic Limestone Rates

THE Alabama Rock Asphalt, Inc., and Dixie Minerals Corp., Sheffield, Ala., have petitioned the Interstate Commerce Commission to reopen for further hearings its docket 23,236, Alabama Rock Asphalt, Inc. vs. Akron & Barberton Belt Railroad et al., involving freight rates on asphaltic limestone, in carloads, from Cherokee and Margerum, Ala., to all points in official classification territory.

The petition states that since the commission's decision in that case there have been numerous changes in conditions which make advisable an investigation of the whole rate situation on asphaltic limestone from the Alabama points to official territory and the readjustment of the rates.

Foreign Abstracts and Patent Review

Effect of Additives on Portland Cement. P. P. Budnikoff and M. I. Nekritsch state the tremendous development in building activities in the Soviet Republic has caused a great demand for building materials and binding agents. In spite of the erection of new cement plants and extensions to old plants it will not be possible to supply the demand for concrete materials, wherefore the productivity of the already existing plants must be increased. One of the methods which can serve for increasing the output is by obtaining cement in less concentrated form by adding neutral materials while grinding. The following experiments have been made to serve this requirement:

Additives employed are chalk, dolomite, marl, etc., the dolomite and marl being used as well in raw condition as in powdered condition after a thermic treatment, dolomite being used after a burn at 400 to 800 deg. C., and marl after a burn at 600 deg. C. The cement, obtained from the Kramatorskaja plant, contained 9.24% Al_2O_3 + Fe_2O_3, 62.13% CaO, 0.38% MgO, 4.51% SO_3, 22.10% SiO_2; it had a loss on ignition of 1.64%; the hydraulic modulus was 2.04, the silicate modulus 2.50, the residue on the 900-mesh metric sieve 0.7%, on the 4900-mesh metric sieve 79.3%. The additive material was dried, then ground fine after a previous drying at 120 deg. C. or after baking to a certain stage. The admixing was done in a ball mill, the additive proportions being 1, 2, 5, 10 and 30%. The resulting "diluted" cement was mixed 1:3 like "pure" cement, with normal Amwrossiewka sand. The water volume was 10%. The cubes were tested according to standard methods after 4, 7, 28 days and 2 and 4 months and the initial and final set determined also. Some of the test specimens were stored parallel in artificially prepared sea water composed of 12.5 grams of cooking salt, 1.5 grams $MgCl_2$, 3.0 grams $MgSO_4$, 1 gram $CaCl_2$ and 0.1 gram KCl per 1 liter water.

The composition of the chalk was 54.40% CaO, 1.99% Al_2O_3 + Fe_2O_3, 0.73% SiO_2, and the loss on ignition 42.69%. The composition of the dolomite was 18.54% MgO, 29.62% CaO, 4.54% Al_2O_3 +Fe_2O_3, 2.64% SiO_2, traces of SO_3, and the loss on ignition was 44.54%. The composition of the Amwrossiewka marl was 79.70% $CaCO_3$ analyzed, 78.75% $CaCO_3$ titrated, 0.43% SO_3, 0.20% MgO, 44.65% CaO, 0.75% Fe_2O_3, 2.70% Al_2O_3, 14.38% SiO_2, and the loss on ignition was 36.32%.

The test results are shown in the accompanying table. A study of these tables indicates that the additives are but slightly detrimental to the mechanical conditions of the cements. The tensile strength of the "pure" cement is a little higher than that of the "diluted" cements, but the compressive strength of the latter exceeds in many cases that of the "pure" cement. Chalk, dolomite, marl and other neutral additives act on one hand as concentrators, on the other hand also as absorbers. The brine developed in hydration coagulates to gel in the presence of sufficient water, and the entire mass becomes denser, more concentrated. The particles of additive enclosed and distributed in the colloidal gel coat themselves with gel. They do not weaken the mechanical strength of the cement, but under certain conditions increase it.

Upon the basis of these results it may be concluded that the additive materials mentioned shall be added to the portland cement in a quantity not less than 10%, at which figure safety is felt against an abrupt decrease in the quality of the cement. The additives should be added in clinker grinding, the cheapest additive being chalk. Upon the basis of the tests described, tests are being made at a cement plant of the Ukrsilikat trust, the material produced being tested in special test construction and in laboratories. —*Zement* (1931), **20**, 9, pp. 192-193.

Mineral Formation of Kaolin-Lime Mixtures. I. Weyer states that the formation of tricalcium silicate from synthetic raw flours starts at 1300 deg. C. In order to determine if the tricalcium silicate which is already formed at this temperature suffers a change when using higher temperatures, the mineral formation between kaolin and lime above the beginning of sintering was investigated.

Five burns were made with meta-kaolin and lime in the proportions 1:8, 1:9, 1:10 and 1:12, at 1450 plus or minus 10 deg. C., for 5 or 6 hours. In mixtures with more than 9 molecules CaO the dicalcium silicate cannot be observed, for all silicic acid is fixed as tricalcium silicate in well formed crystals. In burns with less than 9 molecules CaO, the dicalcium predominates in the unstable modification. The optical characteristics are given.

The compound $3CaO \cdot SiO_2$ is therefore al-

RESULTS OF TESTS ON PORTLAND CEMENT IN KG. PER SQ. CM.

Additive in per cent.		Length of test: Tensile strength — Days: 3	7	28	Months: 2	3	4		Compressive strength — Days: 3	7	28	Months: 2	3	4	Normal paste	Time of set: Initial	Final
Chalk	1%	19.7	21.5	24.2	31.1	27.9	.....	1%	168.2	267.9	259.3	239.2	302.2	.....	27.5	1.15	7.35
	2%	21.2	22.9	23.7	33.0	28.1	.....	2%	233.6	223.7	250.3	322.1	276.6	.....	27.5	1.30	7.50
	5%	20.3	21.3	23.7	28.9	29.0	.....	5%	190.0	257.3	241.4	337.7	279.5	.....	27.5	1.15	7.30
	10%	18.6	20.7	23.4	30.8	27.8	.....	10%	247.4	282.2	282.2	293.2	302.2	.....	27.5	1.00	7.15
	30%	17.2	18.3	20.9	29.0	26.6	.....	30%	235.6	266.6	203.6	265.1	232.5	.....	27.5	1.20	5.30
Dolomite	1%	23.8	22.6	29.2	31.3	32.3	.....	1%	187.5	207.8	196.2	277.4	.....	262.2	27.7	2.00	7.25
	2%	21.5	24.5	32.0	30.7	29.6	.....	2%	194.5	208.1	270.0	244.4	.....	223.7	28.0	1.45	7.10
	5%	22.1	24.8	30.8	30.0	31.8	.....	5%	199.0	243.7	253.3	232.5	.....	259.3	28.6	3.35	9.45
	10%	24.8	23.1	27.0	28.8	32.5	.....	10%	138.5	255.9	274.0	259.3	.....	265.1	29.1	3.35	9.30
	30%	18.4	18.8	24.0	28.2	28.0	.....	30%	190.0	244.4	219.2	202.2	.....	226.6	30.0	4.05	9.00
Dolomite, burned at 400 deg. C.	1%	22.1	22.8	29.7	33.3	31.4	.....	1%	171.2	130.0	147.4	240.0	277.9	.....	27.5	1.18	7.70
	2%	22.0	19.4	27.5	29.2	30.6	.....	2%	118.1	138.5	165.6	227.1	244.4	.....	27.5	1.40	8.40
	5%	18.7	18.7	25.9	28.6	31.3	.....	5%	95.5	138.5	197.5	229.6	279.2	.....	28.5	2.40	9.20
	10%	19.2	19.4	26.6	26.6	28.1	.....	10%	105.3	123.3	156.6	205.1	235.6	.....	29.0	3.20	9.40
	30%	17.6	19.4	24.8	25.8	25.7	.....	30%	87.0	101.1	132.5	211.1	183.7	.....	29.8	4.00	9.30
Dolomite, burned at 800 deg. C.	1%	20.0	20.0	25.6	31.5	.....	39.9	1%	192.9	205.1	266.9	214.3	228.6	.....	27.5	1.15	8.45
	2%	21.5	20.2	24.5	29.3	.....	39.7	2%	162.5	217.7	253.3	211.1	229.6	.....	27.7	2.05	7.35
	5%	20.7	21.1	21.5	30.5	.....	34.1	5%	153.5	185.1	190.2	192.2	223.7	.....	28.2	1.20	7.50
	10%	22.0	22.5	24.3	25.6	.....	35.1	10%	152.5	155.6	178.8	216.2	268.1	.....	28.4	1.35	8.35
	30%	20.1	28.1	22.1	26.5	.....	30.6	30%	108.5	150.3	153.5	199.2	211.1	.....	29.5	2.25	9.15
Marl	1%	17.8	17.7	26.2	27.6	26.7	.....	1%	104.5	138.5	182.9	171.7	199.2	.....	27.2	3.40	7.55
	2%	21.9	25.0	29.0	29.7	34.1	.....	2%	121.1	186.6	196.2	199.2	217.7	.....	27.5	3.35	8.25
	5%	19.1	19.2	27.8	31.7	30.5	.....	5%	141.4	138.5	138.5	199.2	200.7	.....	28.0	2.50	8.35
	10%	20.3	20.7	30.5	32.9	31.7	.....	10%	85.5	136.6	205.1	262.2	250.3	.....	29.1	3.20	7.30
	30%	18.6	18.6	26.2	26.3	28.3	.....	30%	109.6	132.5	171.4	187.0	187.0	.....	32.0	2.15	8.05
Marl, burned at 600 deg. C.	1%	18.5	21.1	25.9	27.8	30.6	.....	1%	153.5	138.8	133.7	196.2	199.2	.....	27.8	3.20	9.00
	2%	17.2	17.5	21.4	24.2	24.3	.....	2%	133.8	129.9	156.6	214.8	234.0	.....	28.3	3.25	9.00
	5%	15.0	21.3	23.8	29.3	23.4	.....	5%	134.6	101.1	159.5	.....	202.2	.....	29.5	3.05	8.35
	10%	15.8	19.8	22.3	26.0	20.1	.....	10%	141.4	144.4	134.5	.....	136.6	.....	30.5	3.15	8.45
	20%	11.4	16.6	21.2	24.5	24.2	.....	30%	130.0	123.0	205.1	.....	278.1	.....	30.3	2.50	8.05
Portland cement 1:3, normal sand		18.4	22.0	28.6	29.3	30.0	.....	.....	214.4	221.1	259.2	264.4	276.7	.....	27.5	2.40	8.00

ways obtainable with constant qualities, regardless of whether its formation from pulverized mixtures results without a fusion phase, or in the fused mass of the aluminate. At 1350 deg. C. the tricalcium silicate did not appear in idiomorphic crystals, but at 1450 deg. C. larger hexagonal aluminate leaflets and cubical crystals appeared, but these appeared mostly as fractures and broken pieces with angles of 90 and 120 deg. Primarily the aluminate forms the bedding and enveloping material in which the tricalcium silicate is located. The embedding of the fundamental body in the fused mass protects it against mechanical destruction during pulverizing of the preparations. Burning at still higher temperatures had no further influence; the preparations consisted of tricalcium aluminate and tricalcium silicate.—*Zement* (1931), **20,** 12, pp. 264-265.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Commissioner of Patents, Washington, D. C., for each patent desired.

Artificially Colored Granule. The inventor prefers to use slag as a base for making colored roofing granules. He impregnates the granules with a solution of a metallic salt and then heats them to such a temperature that the slag and the salt will fuse, making a coating that will not be affected by the weather and one which can be made in many shades and hues. He mentions as examples that the slag (all passing 8-mesh and retained on 35-mesh) may be passed through an acid solution of ferrous sulphate and then heated. This will give a series of reds and browns, varying according to the heat reaction temperature. Salmon is made with a mixture of ferrous sulphate and phosphoric acid. Green colors come from sodium and potassium dichromates. The temperature need never be so hot as to vitrify the granule. Fluxes, such as borates, soda, potash and the like, may be used to aid in the fusion. Some of the solutions used leave the pigment in the form of a powder on the granules, and the coloring matter may be applied in the form of a powder with fluxes if necessary. The patent also covers the process of coloring and heating continuously.—*Harold L. Levin, assignor to the Patent and Licensing Corp., Boston, U. S. Patent No.* 1,788,625.

Plaster and Method of Making Same. The inventor claims to have discovered that the use of a very little soap in plasters made of lime, cement, gypsum or aluminate cement will reduce suction without destroying the porosity of the plaster. Any ordinary soap so added makes a lime soap which is non-hydroscopic and which coats the solid surfaces of the plaster with a thin film. This prevents adsorbtion, which always precedes absorbtion of water by dry plaster, thus reducing suction without plugging the pores. When this plaster is put on as a brown coat the finishing coat may be put on more easily. It is stated that best results are obtained with 0.16 lb. per cu. yd. and that the soap should never exceed 0.35 lb. Amounts given for a cubic yard of this plaster are: Lime, 200 lb.; water, 470 lb., varied according to the nature of the lime, 2500 lb. sand and 0.16 lb. soap.—*Foster Dee Snell, U. S. Patent No.* 1,792,661.

Producing Ground Raw Material for Portland Cement. The inventors claim that their method of grinding reduces the cost of grinding, makes a material that is more easily burned to a clinker that can be more readily and cheaply ground, and makes as an ultimate product a cement which is of superior and uniform quality. Briefly the method consists in grinding so that while the reduction is sufficient for quick and easy fusion there is no large production of "flour" which would form a low-fusing magma in the kiln coating the coarser particles, affecting the lining of the kiln and making non-uniform clinker. Their method is especially valuable to plants that use mixtures of hard limestone and soft shale which have different grindabilities.

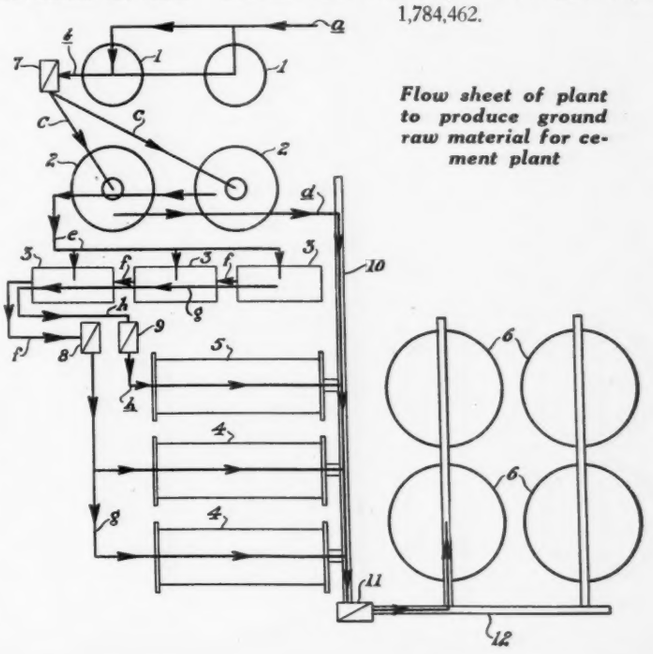
They state that with such materials as much as 52.8% of flour is produced when the materials are ground so that 85% will pass a 200-mesh sieve. Flour is defined as that portion that is lifted by a vertical air current of 30 mm./sec. velocity, the average diameter of the largest particles therein being 0.02 mm. The patent specification gives a number of chemical analyses to show the variation in composition of the differently sized materials. In general the larger particles contain more lime, as the limestone grinds harder, and the finer particles more silica. In one example the $CaCO_3$ content of the flour was 75.7% and of the remainder (47.2%) it was 82%. When hard sand, quartz or quartzite has to be added to the mix to bring up the silica content the softer materials must be considerably overground to reduce any of these to a size that will fuse readily. Otherwise there will be produced grains with only surface contact between limestone and silica, having a high lime ratio that leads to unsoundness.

There may be, it is stated, two raw materials that are suitable in chemical composition but which react unfavorably in burning for the reasons stated. An example is given of a hard and soft shale occurring in the same quarry. The hard shale was satisfactory in the raw material mixture, but the soft shale was difficult to burn and the cement was about 25% lower in tensile strength. Adding the harder shale, if only to 50% of the shale content, brought up the strength and increased the fusibility of the mixture. With the soft shale alone the ground raw material contained 60.5% of flour.

What the inventors have sought to do is to grind the raw materials in such a way as to reduce the flour of the siliceous elements and to secure a better dissemination of the limestone so that the flour shall have a chemical analysis substantially that of the average of the whole. Thus the chemical reactions in the clinkering zone of the kiln will be more spontaneous, resulting in shorter clinkering zones and a lower fuel cost.

The diagram appended shows the method of grinding. The feed of limestone and shale broken to about 1-in. pieces goes, as shown by line *a*, to one of two comminuters, such as Bradley Hercules mills. The product goes by an elevator (7) to two air separators (2, 2), and the part sufficiently ground goes by a screw conveyor (10), and an elevator (11) to the mixing basins (6). The residue goes to three vibrating screens (3, 3, 3), with 40-mesh cloth (about). The undersize goes to two tube mills (4, 4), which grind it to, say, 90% through 200-mesh. The oversize, which will be largely of hard limestone, goes to another tube mill (5), which has the feed adjusted so that it will grind to 98% through 200-mesh. The products of all tube mills go to the mixing basin along with the part taken off by the air separator.

In a second diagram, not shown here, the oversize of the screens is returned to the Bradley Hercules mills instead of being sent to a separate tube mill.—*John A. Miller and Edmund Paul Newhard, U. S. Patent No.* 1,784,462.



Flow sheet of plant to produce ground raw material for cement plant

Portland Cement Production, October

THE PORTLAND CEMENT INDUSTRY in October, 1931, produced 10,762,000 bbl., shipped 12,360,000 bbl. from the mills, and had in stock at the end of the month 21,138,000 bbl. Production of portland cement in October, 1931, showed a decrease of 25.3% and shipments a decrease of 20.8%, as compared with October, 1930. Portland cement stocks at the mills were 2.1% higher than a year ago.

The statistics here presented are compiled from reports for October, received by the Bureau of Mines, from all manufacturing plants except three, for which estimates have been included in lieu of actual returns.

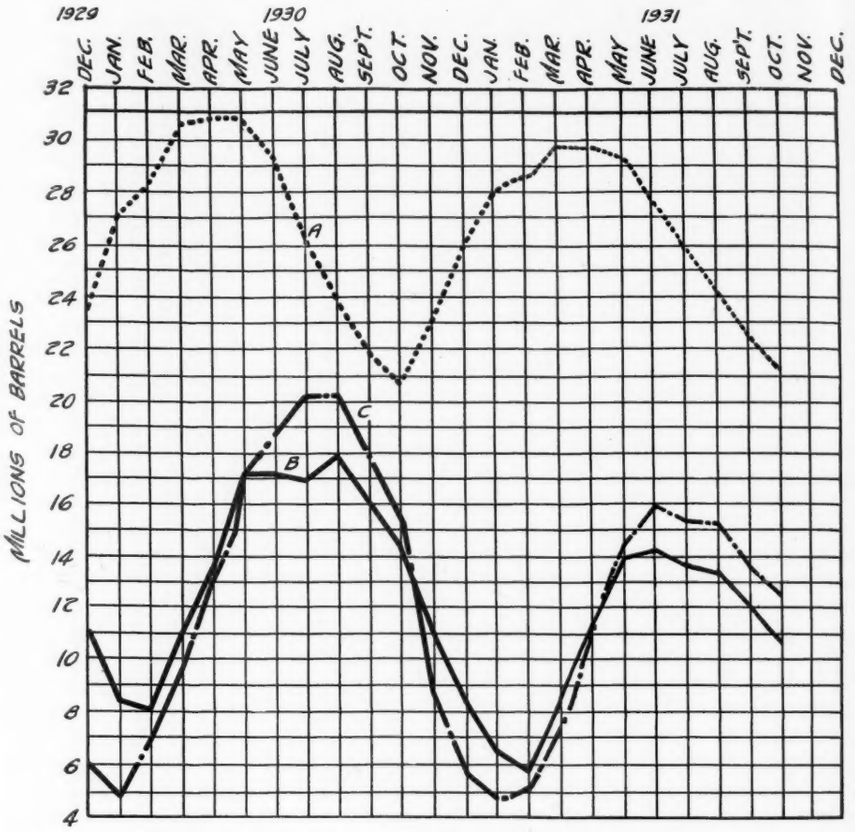
In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 165 plants both at the close of October, 1931, and of October, 1930. The estimates include increased capacity due to extensions and improvements during the period.

RELATION OF PRODUCTION TO CAPACITY

	Oct. 1930 Pct.	Oct. 1931 Pct.	Sept. 1931 Pct.	Aug. 1931 Pct.	July 1931 Pct.
The month	65.4	47.4	55.3	60.2	62.0
12 months ended	64.2	48.6	50.2	52.0	53.8

Distribution of Cement

The following figures show shipments from portland cement mills distributed among the states to which cement was shipped during August and September, 1930 and 1931.


1929
1930
1931
DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
MILLIONS OF BARRELS
32 30 28 26 24 22 20 18 16 14 12 10 8 6 4
A
B
C

(A) Stocks of finished portland cement at factories; (B) Production of finished portland cement; (C) Shipments of finished portland cement from factories

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES IN AUGUST AND SEPTEMBER, 1930 AND 1931, IN BARRELS*

Shipped to	1930—August	1931	1930—Sept.	1931
Alabama	106,464	88,251	68,936	60,846
Alaska	4,465	1,666	1,362	835
Arizona	51,855	37,842	39,785	33,835
Arkansas	165,886	82,714	150,714	49,943
California	868,795	521,774	†836,501	523,744
Colorado	106,576	77,569	82,050	87,979
Connecticut	205,553	159,855	195,962	159,798
Delaware	47,898	30,933	26,704	43,222
District of Columbia	126,581	122,153	137,507	125,178
Florida	85,673	68,905	76,333	51,414
Georgia	186,694	191,428	163,464	164,838
Hawaii	19,301	20,407	16,778	18,544
Idaho	52,084	23,842	46,308	19,173
Illinois	1,604,378	1,063,517	1,704,696	975,734
Indiana	686,122	592,825	497,163	466,096
Iowa	1,077,919	563,562	781,608	305,343
Kansas	271,491	242,108	250,548	173,915
Kentucky	265,288	185,402	241,402	173,093
Louisiana	235,564	498,824	163,544	555,155
Maine	128,866	75,516	148,381	59,275
Maryland	314,239	161,645	285,312	206,115
Massachusetts	328,187	332,816	331,061	392,466
Michigan	1,269,546	787,425	1,018,648	620,928
Minnesota	602,931	668,690	374,833	432,521
Mississippi	96,483	67,290	51,680	33,326
Missouri	770,346	466,196	710,759	424,958
Montana	36,407	34,859	44,217	30,420
Nebraska	226,618	319,336	241,572	264,988
Nevada	14,645	9,907	16,111	12,735
New Hampshire	81,651	78,995	84,449	59,641
New Jersey	709,844	550,716	610,200	599,005
New Mexico	36,680	20,056	28,870	21,342
New York	2,596,407	2,548,291	2,515,171	2,316,622
North Carolina	116,028	77,320	102,658	61,534
North Dakota	31,984	22,552	38,358	19,533
Ohio	1,286,700	700,988	1,103,327	805,284
Oklahoma	360,766	311,923	348,023	140,858
Oregon	114,400	93,759	112,133	88,543
Pennsylvania	1,912,983	869,155	1,557,564	857,987
Porto Rico	4,500	4,035	10,250	4,037
Rhode Island	83,057	59,797	100,664	63,719
South Carolina	236,649	141,224	245,776	186,108
South Dakota	72,829	95,711	86,654	86,660
Tennessee	285,916	106,227	294,910	99,884
Texas	605,660	562,895	573,392	601,256
Utah	44,554	24,194	39,116	26,160
Vermont	104,324	56,224	66,810	49,250
Virginia	179,227	146,156	174,179	151,914
Washington	341,647	223,760	328,595	188,660
West Virginia	216,018	166,437	196,307	161,154
Wisconsin	842,250	712,588	700,327	474,841
Wyoming	20,642	15,674	20,224	12,405
Unspecified	20,373	61,143	4,888	104,386
	20,261,944	15,147,077	†18,046,784	13,647,200
Foreign countries	37,056	24,923	†36,216	23,800
Total shipped from cement plants	20,299,000	15,172,000	18,083,000	13,671,000

*Includes estimated distribution of shipments from two plants in August and September, 1930; from three plants in August and September, 1931.

†Revised.

PRODUCTION AND STOCKS OF CLINKER BY MONTHS, IN 1930 AND 1931, IN BARRELS

Month	1930—Production	1931	Stocks at end of month 1930	1931
January	10,504,000	8,129,000	9,646,000	10,384,000
February	10,008,000	7,473,000	11,572,000	11,946,000
March	13,045,000	9,586,000	13,503,000	13,318,000
April	15,025,000	11,540,000	15,164,000	13,854,000
May	16,607,000	13,159,000	14,668,000	13,087,000
June	15,895,000	12,679,000	13,452,000	11,837,000
July	15,069,000	12,246,000	11,684,000	10,209,000
August	15,244,000	11,664,000	9,275,000	8,468,000
September	14,577,000	10,414,000	7,783,000	*6,918,000
October	13,895,000	9,825,000	7,266,000	6,098,000
November	11,639,000	.....	7,758,000	.....
December	9,484,000	.....	8,809,000	.....

*Revised.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN OCTOBER, 1930 AND 1931, AND STOCKS IN SEPTEMBER, 1931, IN BARRELS

District	Production 1930—Oct.—1931		Shipments 1930—Oct.—1931		Stocks at end of month 1930	1931	Stocks at end of Sept., 1931*
Eastern Penn., N. J., Md.	2,793,000	2,369,000	3,535,000	3,123,000	4,255,000	4,668,000	5,422,000
New York and Maine	1,220,000	1,110,000	1,201,000	1,231,000	1,088,000	1,159,000	1,281,000
Ohio, Western Penn., W. Va.	1,655,000	904,000	1,704,000	1,139,000	3,030,000	3,109,000	3,344,000
Michigan	1,130,000	602,000	1,093,000	616,000	2,317,000	1,893,000	1,908,000
Wis., Ill., Ind. and Ky.	1,938,000	1,337,000	2,115,000	1,662,000	2,546,000	2,324,000	2,648,000
Va., Tenn., Ala., Ga., Fla., La.	1,132,000	1,009,000	1,248,000	1,050,000	1,697,000	1,684,000	1,725,000
East'n Mo., Ia., Minn., S. D.	1,591,000	975,000	1,618,000	995,000	1,542,000	2,341,000	2,361,000
West'n Mo., Neb., Kansas Okla. and Ark.	957,000	795,000	947,000	881,000	1,652,000	1,219,000	1,305,000
Texas	484,000	601,000	469,000	583,000	721,000	558,000	539,000
Colo., Mont., Utah, Wyo., Ida.	134,000	117,000	227,000	185,000	414,000	474,000	541,000
California	953,000	698,000	1,006,000	662,000	963,000	1,085,000	1,050,000
Oregon and Washington	423,000	245,000	436,000	233,000	472,000	624,000	612,000
	14,410,000	10,762,000	15,599,000	12,360,000	20,697,000	21,138,000	22,736,000

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1930 AND 1931, IN BARRELS

Month	1930—Production—1931		1930—Shipments—1931		Stocks at end of month 1930	1931
January	8,498,000	6,595,000	4,955,000	4,692,000	27,081,000	27,759,000
February	8,162,000	5,920,000	7,012,000	5,074,000	28,249,000	28,612,000
March	11,225,000	8,245,000	8,826,000	7,192,000	30,648,000	29,676,000
April	13,521,000	11,245,000	13,340,000	11,184,000	30,867,000	29,715,000
May	17,249,000	14,010,000	17,224,000	14,200,000	30,891,000	29,554,000
June	17,239,000	14,118,000	18,781,000	16,077,000	29,364,000	27,602,000
July	17,078,000	13,899,000	20,153,000	15,545,000	26,289,000	25,934,000
August	17,821,000	13,549,000	20,299,000	15,172,000	23,824,000	24,313,000
September	16,124,000	12,092,000	18,083,000	13,671,000	21,889,000	*22,736,000
October	14,410,000	10,762,000	15,599,000	12,360,000	20,697,000	21,138,000
November	11,098,000	.....	8,784,000	.....	23,056,000	.....
December	8,480,000	.....	5,688,000	.....	25,838,000	.....
	160,905,000	.....	158,744,000	.....	.....	.....

PRODUCTION AND STOCKS OF CLINKER (UNGROUND CEMENT), BY DISTRICTS, IN OCTOBER, 1930 AND 1931, IN BARRELS

District	1930—Production—1931		Stocks at end of month 1930	1931
Eastern Pennsylvania, New Jersey and Maryland	2,470,000	2,089,000	1,025,000	688,000
New York and Maine	1,183,000	992,000	430,000	209,000
Ohio, Western Pennsylvania and West Virginia	1,525,000	741,000	648,000	714,000
Michigan	1,141,000	615,000	819,000	571,000
Wisconsin, Illinois, Indiana and Kentucky	1,706,000	1,140,000	649,000	339,000
Virginia, Tennessee, Alabama, Georgia, Florida, Louisiana	1,088,000	877,000	876,000	597,000
Eastern Missouri, Iowa, Minnesota and South Dakota	1,590,000	924,000	500,000	508,000
Western Missouri, Nebraska, Kansas, Oklahoma, Arkansas	992,000	814,000	301,000	479,000
Texas	522,000	583,000	328,000	266,000
Colorado, Montana, Utah, Wyoming and Idaho	160,000	59,000	329,000	126,000
California	1,091,000	686,000	1,025,000	1,236,000
Oregon and Washington	427,000	305,000	336,000	365,000
	13,895,000	9,825,000	7,266,000	6,098,000

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1930 AND 1931

Month	1930—Exports—1931 Barrels	Value	Barrels	Value	1930—Imports—1931 Barrels	Value	Barrels	Value
January	82,387	$293,135	41,199	$115,678	201,609	$207,461	97,057	$‡132,937
February	64,267	217,798	25,703	88,989	114,455	119,717	22,370	26,250
March	117,563	357,896	54,599	144,579	43,622	59,981	70,532	80,686
April	57,419	200,217	40,478	116,564	140,871	178,226	54,717	61,728
May	57,423	198,170	48,028	140,953	94,696	111,998	20,061	22,794
June	82,077	223,639	43,619	107,977	55,356	74,370	32,080	42,955
July	47,082	166,577	29,494	97,995	12,404	20,973	17,445	22,349
August	49,031	167,579	39,517	106,643	35,323	39,029	9,760	13,404
September	46,664	153,384	27,543	81,399	51,096	59,721	33,575	33,520
October	62,690	190,305	.....	.....	75,284	84,364	.....	.....
November	50,495	151,555	.....	.....	109,124	125,448	.....	.....
December	38,680	134,260	.....	.....	44,157	59,641	.....	.....
	755,778	$2,454,515	.....	.....	977,997	$1,140,929	.....	.....

‡Includes white nonstaining portland cement.

Exports and Imports†*

Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN SEPTEMBER, 1931

Imported from	District into which imported	Barrels	Value
Belgium	Massachusetts	20,591	$21,235
	Porto Rico	2,013	1,461
	Total	22,604	$22,696
Canada	Maine and New Hampshire	23	76
Cuba	Porto Rico	1,011	1,550
Denmark	Porto Rico	8,169	7,249
French Indo-China	Los Angeles	1	5
Japan	Los Angeles	1,750	1,842
United K'gd'm	New York	13	89
Yugoslavia	Los Angeles	4	13
	Grand total	33,575	$33,520

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN SEPTEMBER, 1931

Exported to—	Barrels	Value
Canada	2,457	$ 9,944
Central America	1,852	4,173
Cuba	895	1,927
Other West Indies and Bermuda	5,003	8,795
Mexico	3,294	11,228
South America	11,622	32,368
Other countries	2,420	12,964
	27,543	$81,399

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII, AND PORTO RICO, IN SEPTEMBER, 1931

	Barrels	Value
Alaska	2,061	$ 4,335
Hawaii	21,175	53,757
Porto Rico	7,021	9,912
	30,257	$68,004

*The value of exports of domestic cement is the actual cost at the time of exportation in the ports of the United States whence they are exported, as declared by the shippers on the export declarations.

†The value of imported cement represents the foreign market value at the time of exportation to the United States.

Cement in the Argentine

A CORRESPONDENT of the *Times Trade Supplement* (London, England), writing from Buenos Aires, says: In view of the extensive programs adopted for new road construction and building premises in the Argentine capital and several cities during the coming year, in connection with which the use of both portland and Roman cement will play a prominent part, some concern has been expressed regarding the gradual but persistent decline in imports of British makes.

The increased local supply which has been noted of late years accounts in part only for the shrinkage in British imports, since other European countries, as well as the United States, have greatly augmented their shipments. Belgium, for example, which increased her shipments from 25,600 tons in 1921 to over 160,000 tons in 1930, now supplies over 42% of Argentine cement imports, compared with 4.2% from the United Kingdom. Germany and the United States likewise have widely outstripped British shipments, and are actively competing.

It is estimated that a minimum of 750,000 tons of cement will be required for road and building purposes during the year 1932-33, and of this less than one-half can be produced by local manufacturers, although another local factory has been constructed, bringing the number up to four, and is producing about 300,000 bbl. yearly, with arrangements for doubling this quantity. The construction of four other factories is also contemplated. British cement is seriously handicapped by the substantially lower freight rates ruling from Continental ports and more rapid delivery from the United States.

Cement Markets of Salvador

SALVADOR, bounded by Guatemala, Honduras and the Pacific ocean, has an area of 13,176 square miles and an estimated population of 1,723,000.

Cement is not produced in this country, according to Special Circular 10 of the Bureau of Foreign and Domestic Commerce. Present conditions preclude any great building of roads on the part of the government which probably buys one-fourth of the total imports of cement. For five years preceding 1930 anual imports exceeded 100,000 bbl.

The erection of a cement plant in the Metapan district has been considered. The materials are said to be suitable for the manufacture of a puzzolana cement.

Most of the cement used in Salvador comes from Europe, imports from the United States being unimportant. There is no distributing organization of imports and besides individual buyers, the Salvadoran government purchases for its own account. Importers are wholesalers and retailers and it is not known that any agreement exists among them.

Sand and Gravel Production in 1930

THE total production of sand and gravel reported by producers in the United States for 1930, according to statistics made available by the U. S. Bureau of Mines, Department of Commerce, amounted to 197,051,726 short tons, valued at $115,176,543, a decrease of 11% in quantity and 13% in value in comparison with 1929. There were decreases in quantity and value for the total output of all classes of sand and gravel except paving gravel, the output of that material showing an increase of 7% in quantity, though the total value decreased 3% as compared with 1929. The increase in quantity of paving gravel was probably due to the large amount of road work done in 1930 in the effort to offset to some extent the prevailing business depression and unemployment.

New York and Illinois, with outputs of 20,865,866 and 17,398,693 short tons respectively, were the largest producers of sand and gravel in 1930. Other states producing more than 11,000,000 tons each were as follows, in order of quantity produced: Ohio, California, Michigan and Pennsylvania. New York and Pennsylvania led the states in total value of production in 1930.

About 74% of the total output of sand and gravel was reported as washed and screened in 1930. Detailed figures on the production and value of sand and gravel in 1930 are given in the two following tables:

SAND AND GRAVEL SOLD OR USED BY PRODUCERS IN THE UNITED STATES IN 1930, BY STATES

State	Short tons	Value
Alabama	1,515,160	$ 901,088
Arizona	402,796	361,326
Arkansas	2,720,756	1,555,408
California	12,604,051	7,354,506
Colorado	929,888	442,303
Delaware	74,897	55,193
Connecticut	670,501	446,973
District of Columbia	(*)	(*)
Florida	496,198	269,161
Georgia	586,929	228,396
Idaho	353,839	169,755
Illinois	17,398,693	8,382,025
Indiana	9,838,757	4,667,771
Iowa	4,521,971	2,599,107
Kansas	3,232,858	1,649,476
Kentucky	2,029,456	1,553,812
Louisiana	3,318,965	2,225,211
Maine	5,215,342	806,545
Maryland	2,678,914	2,330,324
Massachusetts	5,226,669	2,790,436
Michigan	11,389,119	5,161,176
Minnesota	4,590,790	2,274,293
Mississippi	2,001,272	1,050,579
Missouri	5,956,766	4,776,078
Montana	1,523,516	471,555
Nebraska	3,443,715	1,731,230
Nevada	489,726	184,691
New Hampshire	939,767	556,808
New Jersey	5,969,479	5,009,866
New Mexico	314,667	282,360
New York	20,865,866	12,710,172
North Carolina	800,222	437,555
North Dakota	473,184	127,505
Ohio	12,679,854	8,173,741
Oklahoma	2,553,070	1,446,137
Oregon	2,824,519	1,644,243
Pennsylvania	11,012,512	11,107,825
Rhode Island	728,390	283,174
South Carolina	744,378	475,009
South Dakota	2,419,441	931,814
Tennessee	2,182,958	1,436,034
Texas	8,803,929	5,567,127
Utah	1,201,849	613,951
Vermont	313,060	67,369
Virginia	1,470,380	997,227
Washington	5,307,622	2,181,012
West Virginia	2,695,437	2,813,284
Wisconsin	7,082,063	2,801,713
Wyoming	(*)	(*)
Undistributed†	2,457,535	1,074,199
Total	197,051,726	$115,176,543

*Included in "Undistributed."
†Includes District of Columbia and Wyoming.

SAND AND GRAVEL SOLD OR USED BY PRODUCERS IN THE UNITED STATES, 1929 AND 1930, BY USES

Use	Short tons—1929—Value		Short tons—1930—Value	
Sand:				
Glass	2,219,677	$ 3,788,471	1,849,101	$ 3,210,973
Molding	6,195,343	6,410,343	3,336,855	3,547,154
Building	41,161,013	23,309,238	33,599,524	18,850,936
Paving	40,801,991	21,131,731	36,367,468	18,674,649
Grinding and polishing	1,636,464	2,303,652	1,115,915	1,613,022
Fire or furnace	440,679	483,551	258,241	333,727
Engine	2,318,931	1,487,906	1,773,204	1,219,070
Filter	100,081	199,838	80,326	167,947
Other*	4,378,875	1,686,627	5,277,984	2,104,075
	99,253,054	$ 60,801,357	83,658,618	$ 49,721,553
Gravel:				
Building	32,448,800	23,813,885	28,271,902	21,346,251
Paving	60,029,164	38,695,207	64,408,274	37,349,936
Railroad ballast†	30,840,887	9,525,530	20,712,932	6,758,803
	123,318,851	$ 72,034,622	113,393,108	$ 65,454,990
Grand total	222,571,905	$132,835,979	197,051,726	$115,176,543

*Includes some sand used for railroad ballast, fills, etc.

†Includes some gravel used by the railroads for fills and other purposes. The quantity of gravel reported as used exclusively for railroad ballast was as follows: 1929, 27,332,529 tons, valued at $8,804,082; 1930, 16,227,543 tons, valued at $5,554,684.

New Mexico to Award Road Graveling Contracts for 1932 Immediately

BETWEEN nine and 14 gravel surfacing federal aid highway projects will be placed under construction this winter as an unemployment relief measure at a cost of $350,000.

Chief Engineer Eccles said the New Mexica highway commission had determined upon the program at the suggestion of Governor Seligman.

All of the projects are on the federal aid highway program for the next summer, and the state will be proceeding with winter construction, backed by funds saved by the highway department during the first quarter, Governor Seligman said.

"Congress is expected," Governor Seligman said, "to make the 1932 federal aid quotas, of which New Mexico's share would be $980,000, available in January. If we wait for congressional action, these graveled projects could not be placed under way before next April. The highway department has the funds in hand. We can aid the unemployment situation in the state materially by proceeding with winter construction on state money, and the only effect will be that the state may have to wait a little longer than normal for reimbursement from the federal bureau of public roads."

Mr. Eccles said gravel surface work is feasible during the winter months. The projects are scattered through the state.

"So long as we have the money," Governor Seligman sad, "we want to regulate the highway construction work, so far as possible, to give men work when they need it most."—*Tucumcan* (N. Mex.) *American.*

Take Popular Subscription for Street Improvements to Aid Jobless

THE CITY OF SIGOURNEY, IA., is helping the unemployed of the community by surfacing the roads in town with crushed rock which comes from the quarry owned and operated by Keokuk county. There will be about 16 blocks of road surfaced.

Business men are taking popular subscriptions from owners of homes on these roads. The subscriptions run from $100 down to small amounts.—*Ottumwa* (Ia.) *Courier.*

Claims Sand Dredge Destroyed Fish Nets—Asks Damages

TWO INDUSTRIES obtaining their products from the Tennessee river clashed in the circuit court when A. B. Henderson, a 70-year-old fisherman, sought to recover damages for loss of a fish net which he alleged was destroyed by a dredge of the Knoxville Sand and Gravel Co., of Knoxville, Tenn.—*Knoxville* (Tenn.) *Journal.*

Indiana Sand and Gravel Men Hold Annual Meeting

THE ANNUAL MEETING of the Indiana Sand and Gravel Producers Association was held November 6, 1931, at the Claypool hotel, Indianapolis, Ind. Sixteen producers were represented, with a total attendance of 30, and an interesting day was spent in the discussion of matters of general interest.

At the morning session, William J. Titus, chief engineer of the Indiana highway department, gave an informal talk on the highway situation, explaining what the department has in contemplation for the coming year. He stated that according to present plans about 500 miles of concrete roads and 100 miles of secondary roads will be built during 1932. In addition to this, some 50 miles of grading will be done with further expenditures of possibly $4,000,000 for new bridges, $3,500,000 for major maintenance and $1,000,000 for minor betterments.

Tom Herrold followed with a talk on the new purchasing arrangements which have now been in effect a little over a month. He explained the advantages of the new plan whereby all purchasing is centralized under one head and also explained how orders are originated and carried through and the new methods used in making payments. The whole thing is still in process of being smoothed out with some details yet to be settled, but it is expected that these will be worked out soon.

Arthur Smith, assistant materials engineer of the department, told of the discussions which have been under way in regard to a proposed change from round to square holes for test screens for the coarse aggregates and also the matter of separating the coarse aggregates into two sizes and recombining them on the job. He stated that no change is contemplated in the test screens or in the specifications, at least for the present.

To Try Out Shipment of Separate Sizes

However, on the matter of separating the coarse aggregate into two sizes and recombining them on the job, Mr. Smith thought this might work out to the advantage of the producer, but suggested first trying it out in practice before making it a fixed part of the specifications. The discussion indicated that quite a number of producers favored the working out of this method of preventing segregation of the coarse and fine materials, the idea being that it would permit them to use more of the pea gravel size, of which there is an excess in many deposits, and keep closer to the tolerance limits of the specifications without danger of having cars rejected.

At the afternoon session the following officers were elected: Ben Stone, of the Merom Gravel Co., president; Ben Neal, of the Neal Gravel Co., vice-president, and Charles F. Connelly, of the Terre Haute Gravel Co., secretary-treasurer. S. C. Hadden, for seven years executive secretary, will continue with the association.

Ben Stone, newly-elected president

The following directors were elected for the two-year term: Charles H. Purdum, of Sturm and Dillard; Lee R. Witty, of the Wabash Sand and Gravel Co., and W. H. Sanders, of the Western Indiana Gravel Co.

REGISTRATION

Anderson-Theobald Co., Vincennes, Ind.: Ed. C. Theobald.
Baker Gravel Co., Noblesville, Ind.: Earl Baker and Ed. Baker.
Connersville Gravel Co., Connersville, Ind.: Fred Neuman and C. W. Piper.
Consumers Co., Chicago, Ill.: James P. Coyle.
Indiana Gravel Co., Indianapolis, Ind.: Jesse A. Shearer, Frank Billiter, Arthur Wilson.
Merom Gravel Co., Indianapolis, Ind.: Ben Stone.
Million Sand and Gravel Co., Lake Cicott, Ind.: Frank Million.
Neal Gravel Co., Mattoon, Ill.: B. E. Neal and E. Guy Sutton.
Northern Indiana Sand and Gravel Co., Wolcottsville, Ind.: Fred W. Tielkar and Dean Ziegler.
O'Donnell Sand and Gravel Co., Vincennes, Ind.: L. D. O'Donnell.
E. T. Slider, New Albany, Ind.: Mr. Schow.
South Bend Sand and Gravel Co., South Bend, Ind.: F. R. Morrow.
Sturm and Dillard, Syracuse, Ind.: Charles H. Purdum.
Terre Haute Gravel Co., Terre Haute, Ind.: George J. Nattkemper and Charles F. Connelly.
Wabash Sand and Gravel Co., Terre Haute, Ind.: Lee R. Witty and L. F. Hart.
Western Indiana Gravel Co., Lafayette, Ind.: M. A. Neville and W. H. Sanders.
Indiana Sand and Gravel Producers Association: S. C. Hadden.
Indiana State Highway Department: William J. Titus, Tom Herrold, Arthur Smith.
ROCK PRODUCTS, Chicago, Ill.; E. C. Harsh.

New Canadian Gypsum Plant Opens

THE NEW GYPSUM PLANT of the Canadian Gypsum Co., Ltd., Hagersville, Canada, has been completed and began the production of gypsum tile, plaster and wallboard on November 2. The plant is located on the site of a rich vein of white gypsum rock of exceptional quality, which was discovered by the company geologist in September, 1930.

"The plant itself," said F. B. Gibbs, sales manager, "has been installed for the most up-to-date manufacturing, designed to take care of the specially-patented processes suited to the nature of this rich gypsum.

"With the building of this plant," added Mr. Gibbs, "the Canadian Gypsum Co., Ltd., completes a chain of developments in Ontario to serve the building trade with a full line of gypsum and lime products. At the same time it is evidence of the confidence held by the Canadian Gypsum Co., Ltd., in the future of Canadian business expansion."—*Toronto* (Ont.) *Mail and Empire.*

Propose Canal in Pittsburgh Steel District

APPROVAL for extending the 9,000-mile Mississippi-Ohio waterway system into the "Ruhr of America" to afford it greater prosperity will be sought early in the next congress.

Tentative plans for the extension already have been drawn by army engineers.

The project will consist of a canal from the Ohio river, northwest along the Beaver, Shenango and Mahoning rivers and the steel cities of Beaver and New Castle, Penn., and Youngstown, Niles and Warren, Ohio.

The canal is designed to afford cheaper and more convenient shipping than on the railroads from "America's Ruhr" as the Youngstown-Pittsburgh steel district is called, according to T. J. Bray, president of the Beaver, Mahoning, Shenango Rivers association.

It is estimated that normally 6,500,000 tons of iron and steel originates in the district, which uses 34,000,000 tons of ore, coal, limestone, slag, and scrap iron.—*Toledo* (Ohio) *Blade.*

New Wisconsin Plant

THE Wissota Sand and Gravel Co., Eau Claire, Wis., is erecting a new plant at Haugen, Wis. The plant will be nearly as large as the one on Lake Wissota when completed. The new plant is being built to supply material for a considerable amount of road work to be done near Haugen next year, and to eliminate freight costs. The company still has a large amount of gravel at its Chippewa Falls plant and will continue to operate it.—*Chippewa Falls* (Wis.) *Herald-Telegram.*

Portland Cement Manufacturers Optimistic

Philosophy of Business Depressions Expounded by Hon. Henry Horner, Cook County Judge

THE PORTLAND CEMENT ASSOCIATION held its 29th annual meeting on November 17 and 18 at the Blackstone hotel in Chicago. While present conditions in the portland cement industry are anything but satisfactory, it can be said in all truthfulness that the general tone surrounding the gathering was one of greater optimism than has been shown in some time.

A note of warning that millions of dollars collected from motorists to build highways may be diverted for other purposes unless car owners and the general public resist such an attempt was voiced by Frank H. Smith, New York, chairman of the board of directors.

Incidentally, at the closing session of the meeting, Mr. Smith, who is president of the Lawrence Portland Cement Co., New York City, and who has served the association for three years as president and for several years in addition as a member of the board of directors, was reëlected chairman of the board.

Charles F. Conn, president of the Giant Portland Cement Co., Philadelphia, Penn., a member of the board of directors of the association for a number of years, was elected treasurer.

Newly elected directors include J. D. Johnson, president of the Canada Cement Co., Montreal, Quebec; John J. Porter, vice-president of the North American Cement Corp., Albany, N. Y.; W. S. Speed, president of the Louisville Cement Co., Louisville, Ky.; L. T. Sunderland, president of the Ash Grove Lime and Portland Cement Co., Kansas City; John Trainor, president of the Riverside Cement Co., Los Angeles, Calif., and H. F. G. Wulf, president of the Monarch Cement Co., Humboldt, Kan.

The principal address of the meeting was made at the annual dinner by the Hon. Henry Horner, judge of the probate court of Cook county, Illinois. The subject of Judge Horner's address was "Why Worry?" and extracts from it follow:

"Why Worry?"

"Of all the variety of forms of depression we have had in the past months—and we've had most every kind in the catalog—the mental depression has most handicapped the happiness and progress of our people.

"There are two things that no one should worry about—first, the thing that can't be helped, and, second, the thing that can.

"Much of the causes that bring a state of mental exhaustion to the business and professional man who finds himself worn out after an exacting day's work is due to his worry as to whether he is doing the wrong thing or the right thing at the wrong time.

"You remember the old familiar rhyme:

'Of all sad words of tongue or pen
The saddest these "It might have been."

"I like its modern addition:

'Add this suggestion to the verse,
'It might have been a great deal worse.'

"My guess is that in the crisis of this depression many of the men who should have been our industrial leaders had lost some of their courage because of the tyranny of worry. There is missing some of that fine and brilliant courage with which our industries have been developed, and has made us the great industrial giant among the nations of the world. We have been worrying so much as a nation that we haven't always thought clearly as to the best way out of our industrial difficulties.

Bugaboo of Fear

"Fear destroys the power of clear thinking and intelligent acting—it overbears reason—surely it does not assist it. It makes those subject to it let go of their confidence in themselves and in their enterprises—even in our country. It loosens every power. 'He who fears being conquered is sure of defeat.'

"My belief is that when industry and the leadership of it gets back its old time courage and confidence and common sense, and a healthy optimism supplants uncertainties, doubt and fear in the solution of its problems—and I'll concede that these problems are difficult ones—our industries of the country will be marching forward again.

"From each of our previous panics or depressions, we have emerged stronger and more experienced. We hereafter continued to enjoy a long period of prosperity, only to overlook our errors of the past and fall into them again. We have had many such experiences since the beginning of the nation and several within our own time.

"In all of them we have had our problems of over-production and over-inflation, but the most serious obstacles to the return of prosperity have been the moaners and the pessimists of the country.

"Pessimists flourish during a depression. They poison the atmosphere with absurd and false rumors and reports. They constitute a real public enemy to business. I like the kind of an optimist who keeps his feet on the ground, not the ballyhoo artist, such as some stock brokers who led many of us up to, but not into, the promised land. The best definition of that kind of an optimist is a blind man looking around in a dark room, at night, for a black hat that is not there.

"The quicker the average business man in this country develops real enthusiasm and confidence in the country, the quicker he will enjoy a returned prosperity.

"Compared with our previous depressions and the recovery from them, we have in the present an exceptional situation. During the decade of prosperity immediately succeeding the great War, we set up a structure in many of our industries, geared to a high state of production, not only sufficient to take care of our then growing domestic needs, but also to meet the large export trade we then enjoyed. The diminution of that foreign trade, added to the low level of domestic activity, has made our present problem that much more complex.

"We are told that there is an uptrend of business affairs and that prosperity is returning. I confess that I cannot tell whether that is so or not, but I join in the earnest hope that it is. There surely are definite and emphatic signs which indicate this prediction to be true.

"When prosperity comes again to us, it will come because we shall deserve it.

The Will to Meet New Situations

"Prosperity shall come to us as a reward for our willingness and our readiness to intelligently meet the newer situations. And when it comes, we must adhere to those homely civic and private virtues, which we have somewhat neglected, and which enabled this country in its pioneer days to overcome every obstacle.

"Man has two sets of duties—one to himself and the other to the society to which he belongs. If a man deserves to have the advantage of living in an organized community, he must consult not only his own fortune, but also that of society and of his neighbors who form that society. He must realize that *its* prosperity is *his* prosperity and that it cannot suffer without his own injury.

"There are many problems which go to the vitality of our country which are not entirely industrial, but upon which commercial prosperity is in a great measure dependent. These are the problems of citizenship which deal with the maintenance of the fundamentals of American life and of government.

"Good citizenship requires, above all, integrity in business and the professions.

"Every business and profession imposes a trust to deal fairly and honorably.

"Failure to recognize that by those in

whom the very highest trust was imposed, has contributed much toward destroying public confidence.

"There is an element in our country that insists upon holding the government responsible for all economic and social maladjustments. They thus talk of the government as something away from and not a part of themselves.

"Who and what is our government? It is ourselves. Who are the officers of government, whether local or state or national? They are merely the agents for the time being of the citizenship.

"We sometimes say, with discouragement, that all we can do is to select the best men and women we can get, among those who are willing to stand for office and if they fail us, we are not to blame. That may be partially true, but not entirely so.

"When you employ representatives to do work in your industrial enterprises, you constantly confer with them and watch them and watch and check their activities during their employment. You don't wait until they have wrecked a plant or entirely destroyed your business before you step in. Furthermore, your representatives in business know you are definitely and constantly interested in what they are doing.

Hold Government Officers to Their Responsibilities

"If a public official, whether an alderman, a mayor, a state legislator, a governor, a congressman, or a senator, an assessor, and so on, whatever his office, knew that a considerable body of his constituency was on the constant watch to see that he responded in full to his duties, he would be more likely to consider his office a public trust rather than a private enterprise and a mere source of income.

"Our citizenship is beginning to resent, as it should have done years ago, the invasion of the Federal government into the field of private business. There is more danger in that respect than in the futile attempts of Communism to gain a foothold in our nation.

"The less government we have in business, the better off the business of the country will be—and government too.

"The important subject of taxation both local and federal is one of the serious problems of both business and government.

"Some of those who are seeking by additional and increased taxation to relieve local and national government of deficits are overlooking an important element of the problem, namely, the reduction of the cost of government which is, in most cases, excessive and wasteful.

"The cost of government has increased 350% in 20 years. Extravagance in public office is a flagrant violation of public trust and is akin to downright dishonesty. Graft is nothing short of treason. These are the citizen's problems and not the politician's problems. Party is subordinate to country, not only in these times, but always.

"There is nothing the matter with our form of government except the neglect thereof by its citizens.

"Let us not forget that our great nation through the patriotic devotion of its citizens has in the past solved all its difficult problems as it will those that presently concern us.

"It is to groups of men like you that the country must look for balance and courage, not only in its industrial problems, but in its civic problems.

"Your group is potent in business with its millions of invested capital, and the many thousands you employ in your industry. Your industry dots the country with plants in 30 states from New York to California.

"You blast into the mountains for your product by thunderbolts seemingly forged by Vulcan himself.

"The handiwork of your ingenuity and industry is found in our highways and public works and our private buildings. You are a potent factor in construction throughout the country.

"Interested in so many projects and localities of the nation's activities, you are in constant touch with the needs and the pulse of our people.

"Your influence is felt in the business life of the nation, but your country needs even more than that from you.

"It needs your contribution to the duties of citizenship. It needs men of your social intelligence and moral fibre.

"Yours is the important task to see that this generation maintains and passes on to the next generation an appreciation of the value of our institutions and an understanding adherence to the precepts of a government which has made us the outstanding exponent and protector of human rights.

"We are indeed encouraged by the appearances and the prospects we again are facing of a returning prosperity."

"Chicago Tribune" Dislikes State Highway Department's Brick-Road Policy

THE PORTLAND CEMENT INDUSTRY evidently has an impartial friend in the *Chicago* (Ill.) *Tribune*, which printed the following story in the main news section of its Sunday, November 1, issue, under the caption: "Fifteen Wrecks in a Rainy Day on New Brick Road—Rebuilt Lincoln Highway is Accident Maker." This is the story just as printed:

"In the St. James hospital at Chicago Heights yesterday were the latest victims of a series of accidents on the five mile section of the Lincoln highway in the southern part of Cook county which was resurfaced with brick this year.

"The Dettmering garage at Matteson reported that as many as fifteen wrecks a day were happening during rains on the five miles of newly resurfaced highway.

"One farmer, Ernest Blume, west of Matteson, said eight automobiles have crashed into the ditch in front of his place in the last thirty days. One of these was a loaded gasoline truck which knocked down sixteen fence posts.

"Two weeks ago, according to the county highway police, a woman driver stopped her automobile on the pavement after witnessing one of these skid into the ditch. Before the drivers behind her could stop, eight cars slid into collision.

Brick in Place of Concrete

"The resurfacing on this section of the Lincoln highway was part of the 63 miles of similar brick work in Illinois this year approved by Gov. Emmerson over protests that it would be just as cheap to widen the highway to forty feet of concrete. The old concrete, sixteen or eighteen feet wide, was deteriorating rapidly. It was of an antiquated design, without a center expansion joint and without reinforced outer edges.

"Over the surface of the bricks is a thin coat of asphalt filler for the seams between the bricks. It leaves a surface similar to places which state officials have postered with the warning, 'Caution, slippery when wet.' The wet asphalt also reflects the headlights of oncoming cars, making it difficult to see the center line. Beside the pavement is a narrow, slippery and soft clay shoulder which carries cars into the ditch once they skid off the asphalt coated bricks."

But Gravel Producers Profit!

Three weeks later the *Chicago Tribune* carries the following news item:

"Workmen for the state highway department began to lay a surface of tar and gravel on a five-mile stretch of brick pavement on Lincoln highway west of Chicago Heights yesterday. The stretch had been resurfaced with brick this year.

"The order to put on the new tar and gravel coating, it was revealed, followed the report of three weeks ago that in rainy weather the brick pavement was so slippery that it caused an unusually large number of accidents. The brick extends from a mile and a half west of Chicago Heights to the Will county line.

"Three weeks ago the Dettmering garage at Matteson reported that as many as fifteen wrecks a day were occurring during rains on the newly resurfaced highway.

"The brick resurfacing west of Chicago Heights was part of the 63 miles of similar work in Illinois this year approved by Governor Emmerson. There were protests that it would be just as cheap to widen the highway to 40 ft. of concrete. The old concrete, 16 to 18 ft. wide, was deteriorating rapidly."

Rumors of a Milwaukee Merger of Gravel Producers

THE FOLLOWING news item from the *Milwaukee* (Wis.) *Journal* of November 15 seems to have been based on rumors which a ROCK PRODUCTS editor, immediately on the spot, was unable to run down:

"After 60 days of negotiating, a merger of sand and gravel, fuel and building material producers and dealers has been agreed upon by firms representing 60% of such business in Milwaukee county.

"Articles of incorporation for the new firm, to be known as the United Materials Corp., were expected to be filed November 17, according to confidential information. The new firm will be capitalized at $1,500,000. There will be no public financing. More than $500,000 of the capital will be new money from Buffalo (N. Y.) building material interests and Chicago (Ill.) building material distributors.

"The other two-thirds of the capital will consist of local properties to be merged. Control of the new corporation will remain in local hands. The complete set-up is to be effected in 30 days. Yards and offices will be centralized.

"According to one of the prospective officers of the new company the organization is expected to correct some of the cut-throat competition from which the sand and gravel business, particularly, is said to have suffered in the last several years. It is also interpreted as a sign of confidence in the expected recovery in the local building trades.

"Participants in the new merger say that the United Materials Corp. will be the biggest distributor of building materials in Wisconsin. It is pointed out that the new firm will afford merging building material dealers sounder credit rating with local banks than they have enjoyed as individuals."

Killed by Car Puller

CAUGHT by the cable of an electrically-operated winch at the plant of the Lone Star Cement Co., Lawrence Forbes, 28, of South Norfolk, Va., was squeezed to death as the heavy rope wound round and round a capstan, binding him to it.

Mr. Forbes, a member of the force maintained at the plant at night, was the operator of the winch, which hauled coal cars to a chute and dumped them. He was working alone at the time, having reported for duty at 6 o'clock, and was not missed until nearly three hours later. No outcry was heard.

Fellow employes found the body bound tightly against the winch with 12 to 15 turns of the rope about it. The mechanism had stopped, apparently having been "choked down" by the obstruction. The cable was drawing an 80- or 90-ton gondola.—*Norfolk* (Va.) *Pilot*.

New Chairman of the Manufacturers' Division of Gravel Association

D. D. GUILFOIL, of Sauerman Bros., Inc., Chicago, Ill., recently elected chairman of the Manufacturers' Division of the National Sand and Gravel Associ-

D. D. Guilfoil

ation, is an old friend of most of the members of the association, active and associate. He is a very much experienced gentleman in the sand and gravel industry having traveled extensively throughout the world in the interests of his company. He is probably more familiar with conditions in Russia, for example, than any other man in the industry. It is to be hoped that his new office in the association will overcome some of his natural modesty, and that all will have an opportunity, formally or informally, to be entertained and instructed by his reminiscences and his philosophy, as a few of his more intimates have often been.

Uses Silica in Imitation Stone

A NEW PRODUCT is being manufactured by the Lininger Supply Co., Conneaut, Ohio. It is made of silica, sawdust and other materials, the *Conneaut* (Ohio) *News-Herald* reports.

So far novelties have been produced such as book ends, ash trays, etc. It is claimed to be possible to replace highly glazed tile for bathrooms and similar uses at about one-fifth the cost of marble.

The new product is known commercially as Stansell-Stone.

Roland D. Doane Joins Taylor, Rogers and Bliss, Inc.

ROLAND D. DOANE, for several years advertising and sales promotion manager of the Lehigh Portland Cement Co., Allentown, Penn., has joined the organization of Taylor, Rogers & Bliss, Inc., New York, N. Y., as director of its dealer service division.

Taylor, Rogers & Bliss, Inc., specializes in market analysis and sales development in the building industry. This organization is working with a number of leading building material manufacturers and their advertising counselors in the merchandising of materials and equipment to architects, contractors, owners and other buyers of the building field. The new dealer service division is established to work closely with building material dealers throughout the country, assisting them with sales plans for products, particularly specialties, which may be sold profitably to local buyers.

Clients of this organization include: Lehigh Portland Cement Co.; International Nickel Co.; Grinnell Co.; National Steel Fabric Co.; Common Brick Manufacturers Association; Haydite Manufacturers Association; Western Brick Co.; David Lupton's Sons Co.; Vitaglass Corp.; Congoleum-Nairn, Inc.; and other leaders in various divisions of the industry.

Ed W. Russell Appointed Sales Manager of Cumberland Portland Cement Co.

M. C. MONDAY, president of the Cumberland Portland Cement Co., Cowan, Tenn., announces the appointment of Ed W. Russell as sales manager, succeeding J. Foster Cook, whose death occurred October 31.

Assisting Mr. Russell in the handling of sales of "Cumberland" portland cement and "Cumberlite" masonry cement will be Sam C. Gates, Frank Beasley and Bob Overton, representatives, and H. Frank Hughes, traffic manager.

To Open New Mica Plant

THE John M. Zeesman Mica Corp., a Chicago concern, has located in Lineville, Ala. This company has leased for two years the Lineville Farmers Union Warehouse, which will be converted into a modern plant with latest machinery for grinding, washing and drying mica. This plant will have a floor space of 60x210 ft. Employment will be given to approximately 30 men and women to start with. Clay, Randolph and Cleburne county farmers will be given a market for the deposits of mica in these counties.

John M. Zeesman, president and manager for the company, left recently for St. Louis to buy machinery and the plant is expected to begin operation by January 1.—*Birmingham* (Ala.) *News*.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Increasing Trade Area Stabilizes Operations of Longview, Wash., Producer

By W. A. Scott

AN EXCELLENT EXAMPLE of diversified production is found in the operation of the Longview Concrete Pipe Co., Longview, Wash. Its production includes culvert and sewer pipe, building units, drain tile, common and faced concrete brick, septic tanks, chimney blocks, foundation piers, gas and water meter boxes, lighting standards, guard rail posts, and garden and lawn furniture. The increasing local demand for ready-mixed concrete is also fully met. In addition to its products plant production, the company is gradually developing a business in the resale of building and paving materials.

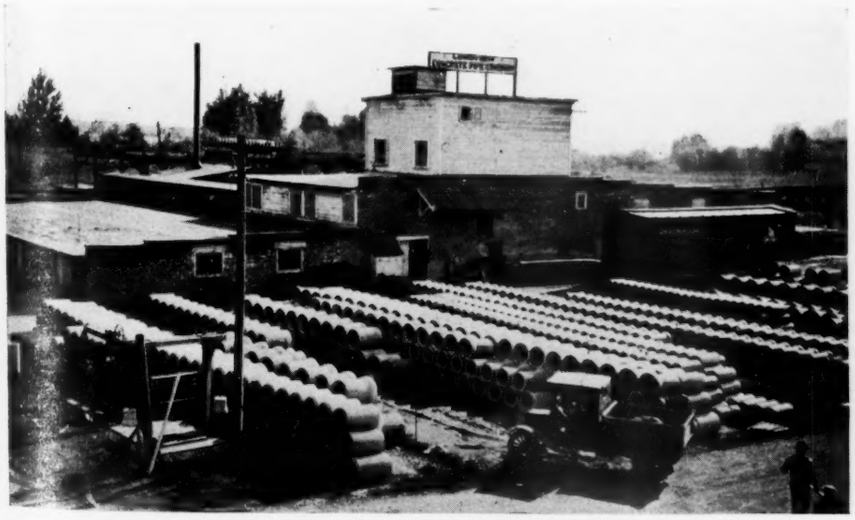
Aggregate storage and river equipment

Close Attention to Prospective Work Keeps Plant Busy

Even now close attention to prospective public and private work enables the company to maintain a regular force and to keep the plant reasonably active.

The site of the works is on the Cowlitz river, 6 miles above its confluence with the Columbia river. This location affords barge transportation for receiving sand and gravel from Portland, and for the shipment of concrete products to various landings on the Columbia.

Cement, reinforcing steel and other supplies are delivered at the plant by rail.



The plant and part of the stock piles

The products for city, town and rural deliveries are carried by motor trucks. Included are those required for highway work, land drainage and industrial plants.

River Transportation Used Extensively

The company operates its own barges and tugboats for transporting graded sand and gravel from Portland to its 3000-cu. yd. capacity bunkers.

The gravel used at the Longview plant comprises standard 1-in. material retained on a ¼-in. screen, the sizes delivered consisting of ⅜-in. to ½-in. and ½-in. to 1-in. In addition to that required for the concrete products plant, the company ships in two grades of paving gravel, which are sold to highway and city paving contractors.

The sand produced by the Portland Gravel Co. for the Longview Concrete Pipe Co. is composed of Williamette river washed sand of ¼-in. minus, plus a built-up aggregate screened out of the crushed gravel product on the dredge. That is, the disc product is washed through a revolving screen having ¼-in. openings, and

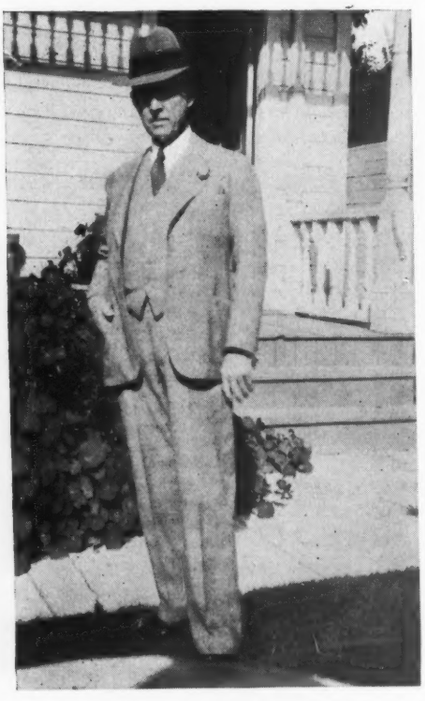
equipped with a sand jacket. The sand passes to a settling box, the overflow going to waste and the clean sand feeding into a screw conveyor by which it is delivered to the barge. The built-up sand from the gravel crusher, when mixed with the ¼-in. minus river sand, gives the sand content required for concrete pipe, building units, drain tile, brick and some other products. Other sand delivered to the Longview bunkers, which is sold as plaster sand, consists of Columbia river material. This is graded to pass a 6-mesh screen.

The quantity of sand and gravel delivered at the Longview bunkers for 1931 is estimated at 25,000 cu. yd. This volume is partly for plant operations, but mostly for ready-mix concrete and for resale to public works contractors.

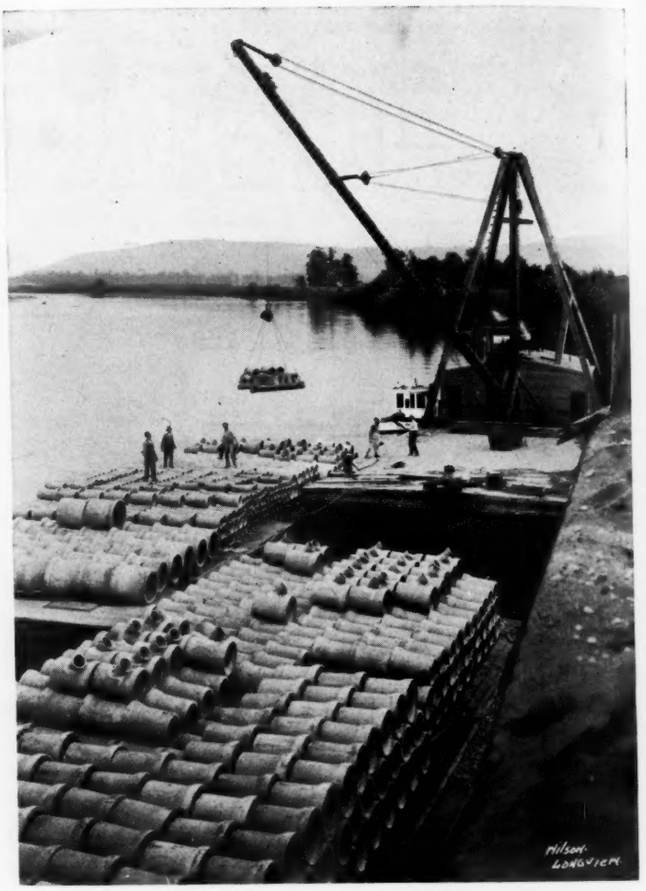
Ready-Mix Concrete Is Also Produced and Sold

Ready-mix concrete demands have developed within the last 18 months. One of the large mixers in the plant is used for this work, the concrete being delivered in trucks having bath-tub bodies of 3-cu. yd. capacity. The customers, as a rule, are those who require concrete for quick work.

The sand and gravel bunkers, extending 250 ft. along the Cowlitz river bank, are of heavy timber construction and have 6 compartments, with 3 truck-loading runways below. Material is transferred from barges to bunkers with a steam-operated derrick and a 1½-yd. clamshell bucket. It is drawn from the bins into 4-cu. yd. trucks and hauled about 600 ft. to the plant. Material in separate grades is dumped into a receiving hopper that discharges into the boot of a 70-ft. bucket elevator, the latter discharging the gravel grades into a revolving screen in the top part of the building, and feeding the sand into bins. The four screen sections make that number of gravel classifications from ¼-in. to 1½-in. The screen oversize is recrushed and passed to the same bucket elevator. The proportioning for the several mixer batches is made up with a 5-cu. ft. measuring box, having five 1-ft. compartments, which moves along below the feed-bin chutes. Each volumetric charge thus made is emptied into any one of three overhead carriers that serve the four concrete mixers used in the plant.



W. H. Sharp, long active in the concrete products field



Loading shipment for delivery on Columbia river

Plant Equipment to Produce Many Products

A Tuerck-MacKenzie unit, comprising a concrete mixer, paddle feeder and a No. 2 pipe machine, serves for the manufacture of culvert and sewer pipe in sizes from 4-in. to 30-in. For reinforced pipe, the machine is operated with either a single or double tamper. The Duntile machine, served by a Blystone mixer, is operated for making either structural units or drain tile.

The three Shope brick machines use concrete from a Wonder mixer, which also serves for making stonetile, poured pipe and ready-mixed concrete. When concrete lighting standards and guard-rail posts are being produced, concrete from this mixer is discharged into a 5-cu. ft. container which is taken by an overhead carrier to forms attached to the outer wall of the building.

The main factory building, 150 ft. by 250 ft., contains 14 curing rooms, 20 by 50 ft., each having two steam lines and sprinkling pipe. The products are subjected to 72 hours of steam curing in these rooms, followed by a period of sprinkling before being removed to the yards. All plant machinery is operated by belt drives from one main line shaft, the latter being belt-connected to the motor.

Secondary to the principal products are several small lines of work that add to the gross output without much increase in expenses. One of these consists of preparing track sand for railroads. The equipment for it consists of a small bunker structure in the yards, to which Columbia river sand is delivered and elevated to a set of wet screens, by which is produced a grade of material that may be used either for track sand or plaster sand. That required for sanding tracks is discharged into a railroad car in the bunker runway.

Then, in a separate building is produced ready-mixed lime mortar for plastering and lime-putty mortar for hard-wall finishing.

Relative to concrete culvert pipe, both bell and spigot and tongue and groove types are produced. For state highway work the bell and spigot pipe is specified. However, the counties and cities accept either class.

For years the operations and business of the Longview Concrete Pipe Co. have been under the management of W. H. Sharp, who served two terms as president of the Northwest Concrete Products Association, and later as one of the directors of the American Concrete Pipe Association. His son, J. W. Sharp, has charge of products sales and shipping.

Jobless Aided by Public Work

UNEMPLOYMENT relief measures designed to make the jobless self-supporting are receiving the consideration of public officials and relief organizations in every section of the country, according to reports from many sources. A real determination to sidestep direct charity as far as possible so as to minimize its demoralizing effects is evident.

Construction of public improvements in many localities is proving effective in creating jobs for unemployed men. Some of the projects reported that are being undertaken as relief measures are summarized below:

In Duluth, Minn., a bond issue of $250,000 was voted at a special election on October 13. The money is to be used for needed bridge repairs and storm sewer construction as an aid to unemployment relief.

Santa Monica, Calif., recently voted $690,000 in bonds to build a 2,000-ft. concrete breakwater which will give the city a large yacht harbor. This project was first proposed on July 1 as a means of creating jobs for local men, and plans were carried through so rapidly that work is already under way.

The Westchester County Sanitary Commission in New York is rushing work on a sewage treatment plant and extensions of sewer lines which will require an expenditure of $3,715,000. Work will be carried on through the winter.

Roanoke Rapids, N. C., is also constructing a sewage treatment plant at an expenditure of $350,000. It is estimated that this project will bring work for all the unemployed common labor in Halifax county in which the city is located.

Salina, Kan., has advertised for bids on two sewer projects to be carried out as an aid to employment.

Yakima, Wash., is to spend $70,000 in paving streets as a relief measure.

Of the New Jersey state funds for the relief of the unemployed, more than $4,000,000 has been designated for use in payment of wages only. This money is available to counties and municipalities which will match it with an equal amount for construction of public improvements.

At Cleveland, Ohio, $300,000 is being spent to lay tile drains along county roads, thereby eliminating open ditches. All work is being done by hand, and about 2,000 men are at work.

In Muncie, Ind., 191 men are being employed at present as a result of a program of remodeling homes being pushed in that city. Muncie is also using unemployed men to set back curbs at intersections, making crossings safer.

Ogden, Utah, is raising a fund of $150,000 to be used in paying workmen given jobs on municipal projects.

All unemployed men in Grand Rapids, Mich., are given part time work constructing needed improvements around the city. The local Association of Commerce reports that the city receives 82 cents worth of labor on public projects for every dollar expended in relief work. Already the men have created a new park, built a municipal swimming pool, widened several streets, and done dozens of other jobs which will bring permanent benefit to the city.

Preliminary Program of American Road Builders' Association

THE American Road Builders' Association, Washington, D. C., has issued the Blue Book giving the preliminary program for the 29th Annual Convention and Exposition to be held in Detroit, Mich., January 11-15. This book also contains information on committee activities and an outline of reports.

Seriously Injured by Falling Rock in Quarry

FOLLOWING an amputation of his left foot, Homer Gilliam, 22, employe of the Ash Grove Lime and Portland Cement Co., at Galloway, Mo., was in a critical condition at Springfield Baptist hospital.

Besides the foot injury he also sustained a fractured skull and chest injuries, when he was crushed beneath a rock in the quarry.

Mr. Gilliam was breaking rock when the boulder became loosened and rolled from a ledge 20 ft. above him.—*Springfield* (Mo.) *Press.*

Governor of Virginia Urges More Road Building

THE GOVERNORS of 16 states have endorsed the proposal made to President Hoover and the President's Organization on Unemployment Relief by Governor John Garland Pollard, of Virginia, that congress authorize increased advances to the states for highway work, according to an announcement by Governor Pollard.

The plan suggested is that allotments be made to such states as may desire them in an amount not exceeding three times the normal annual allotment of road money, to be repaid by annual deductions from Federal aid funds normally apportioned to such states, the deductions being spread over a 10-year period.

Four Governors Opposed

Governor Pollard stated that the governors of Maine, Oklahoma, Rhode Island and Washington opposed the plan, while it was approved by the governors of Arizona, Arkansas, Florida, Georgia, Idaho, Illinois, Kansas, Mississippi, Montana, North Carolina, North Dakota, Pennsylvania, South Carolina, Tennessee, West Virginia and Wyoming.

The proposal was set forth by Governor Pollard in a letter to the other governors. The letter follows in full text:

"My dear Governor: I have suggested to President Hoover and to Mr. Walter S. Gifford, director of the President's Organization on Unemployment Relief, that the most practical way in which the United States government could cooperate in furnishing work for the idle in Virginia would be on the following plan:

"For congress immediately on its convening to provide for the advance to such states as may desire it a sum not exceeding three times the amount of the normal annual allotment of road money to the states, said advance to be repaid by annual deductions from the Federal aid funds normally coming to such states, such deductions to be spread over a period of 10 years.

"This would go far toward relieving unemployment in those states whose general assemblies can not issue bonds.

"It seems to me that if we are to avoid the dole with all its attendant evils, we must provide employment. The country needs roads and expenditures in this direction can be made without economic loss. Road work will engage a larger number of the unemployed than any other line of construction, and money spent in this direction can be extended to the point of greatest need.

"The plan would entail no additional expense on the Federal government, but would simply be an advance against appropriations which the Federal government will make in accordance with what seems to be its fixed policy.

Early Relief Foreseen

"Some objections might be entered to this plan as not giving relief during the coming winter when road work is to some extent suspended. This objection, to my mind, is not tenable because much of the material used on the roads is prepared in winter in many parts of the country, and work of engineers, draftsmen, clerks, etc., in preparation for actual road building can be carried on through the winter months; but most of all the knowledge that an extensive road building program is to be begun in the early spring will give hope and confidence and afford credit to thousands of working men.

"The unemployment situation is so serious we must have the cooperation of the local, state and federal authorities, and the plan I suggest seems to be less burdensome to the Federal government than any other plan which has been advanced.

"I should like for you to write me whether such a plan would be helpful in your state and whether you are willing to cooperate with me in asking its consideration by the President's Organization on Unemployment Relief."

The Rock Products Market

Wholesale Prices of Aggregates

(F.O.B. Plant or City Designated)

Prices given are for crushed limestone per ton, unless otherwise stated	Crushed stone: Screenings, ¼ in. down	Crushed stone: ½ in. and less to 2½ in.	Sand: ¼ in. and less	Gravel, ½ in. and less to 2 in.	Slag: Screenings, ¼ in. down	Slag: Crushed, ½ in. and less to 3 in. and larger
EASTERN:						
Alexander, N. Y.			.65d	.65d		
Bethlehem, Penn.					.50– .60	.50–1.00r
Boston, Mass. (g)			1.15	1.75		
Buffalo, N. Y.	1.25¶	1.25¶	1.00–1.10d	1.00–1.10d	1.50d	1.50–1.60d
Clarence, N. Y.			.60v	.60v		
Durham, Penn.			.70– .80	.80– .90		
Hillsville, Penn.	.85	1.35				
Montoursville, Penn.			.75	.50		
New York City			1.00	1.50		
Oriskany Falls, N. Y.	.50–1.00	.80–1.00				
Philadelphia, Penn. (trap rock)	2.10w	2.25–2.50	1.40	1.95		
Rochester, N. Y.			1.40	1.40		
Washington, D. C.			.85	1.30		
CENTRAL:						
Alton, Ill.	1.75	1.75				
Cape Girardeau, Mo.	.90	1.00				
Davenport, Iowa	1.00	1.25				
Eau Claire, Wis.			.30– .40	.65– .85		
Grand Rapids, Mich.			.40– .50	.60– .70		
Greenbush, Mich.			.35	.65		
Hannibal, Mo.		1.40				
Indianapolis, Ind.			.40–.81*	.67½–.94½*		
McCook, Ill.	.60	.60				
Milwaukee, Wis.	1.14	1.24	.75	.90		
Munger, Ill.			.25	.40		
Pacific, Mo.			.70	1.00–1.10		
Riverton, Ind.			.40– .50	.40– .60		
Sheboygan, Wis.	1.00	1.00				
Stone City, Iowa	.75	1.00				
St. Louis and Maplewood, Mo.	1.25	1.25				
St. Paul, Minn.		1.25	.35	1.25		
Toledo, Ohio	1.10	1.60			1.00	1.10
Waukesha, Wis.	.90	.90	.40	.50		
SOUTHERN:						
Atlanta, Ga. (granite)	1.10	1.50				
Ensley and Alabama City, Ala.					.55	.80–1.25j
Chico, Tex.	.50	1.10				
(Trap rock)	2.25	1.15–2.50				
Cayce, S. C. (granite)	.50	1.40				
Houston, Tex.			1.25*	1.95k		
Knoxville, Tenn.	.50	.60	.60– .80	.90–1.20		
Longdale, Va.					.75	1.05–1.25
Montgomery, Ala.			.25– .35	.50– .60		
Paducah, Ky.			.45	.60– .90		
Richmond, Va.			1.15	1.75		
Roseland, La.			.40	.75	.75	
San Antonio, Tex.	1.25¶	1.25¶		1.25		
Tyrone, Ky.	.50– .90	.50–1.25				
WESTERN:						
Crushton, Calif. (San Gabriel Valley) (granite)	1.40	1.40	.80	1.40		
Denver, Colo. (h)			1.25*	2.10*		
Long Beach, Calif. (Granite and trap rock)	2.40	2.40	1.50	2.40		
Phoenix, Ariz. (n)			1.15	1.00–1.50		
Roscoe, Calif. (San Fernando Valley) (granite)	1.40	1.40	.80	1.40		
Salt Lake City, Utah			.60	.60		
San Francisco, Calif. (Bay points)			1.45	1.45		
Seattle, Wash.			1.25*	1.25*		
Spokane and Irvin, Wash.			*1.00¶–1.50x			
Tulsa, Okla.	.70s	1.35s				

*Prices per cu. yd. ¶F.o.b. cars. †Less 10c per ton monthly settlements disc. ‡Prices less 5c disc. per ton for payment 15th following month. (a) Consumer prices subject to cash disc. of 10c per ton. (b) ½ in. to 1½ in. (c) 1½ in. and less. (d) F.o.b. trucks at plant. (e) Delivered in truck loads. (f) ¾ in. to 2½ in. (g) Delivered to job by truck, Boston. (h) F.o.b. job site via motor truck. (j) 3 in. and larger, 80c; ½ in. and less, 1.25. (k) Less 10c cash disc. (m) 2 in. and less. (n) Per cu. yd. f.o.b. bunkers. (p) Hard-head stone. (q) ¼ in. to 2½ in. (r) Crushed slag, ½ in., 90c–1.00; ¾ in., 50c–70c; 1½ in., 60c–70c; 2½ in., 60c–80c. (s) Less 15c per ton for cash 10 days. (t) Delivered on job. (u) F.o.b. plant. (v) F.o.b. cars or trucks. (w) Also 3.45. (x) Per cu. yd. delivered by truck in city of Spokane.

Whiting

St. Louis, Mo., per ton	15.00*
Chicago, Ill., prices per ton.	
Domestic putty whiting	10.00–12.00
Domestic precipitated whiting	15.00–20.00
Imported bolted whiting	30.00–35.00
Philadelphia, Penn. — English chalk whiting packed in 50-lb. paper bags, per ton, in carloads	15.00

*Packed in bbl., f.o.b. St. Louis.

Roofing Slag

Prices given are per ton f.o.b. city named.

Bethlehem, Penn.	1.00–1.50‡
Buffalo, N. Y.	2.50†
Ensley and Alabama City, Ala.	2.05
Erie and Du Bois, Penn.	2.50†
Longdale, Va.	2.50
Toledo, Ohio	1.10

*Less 5c ton disc. for pay. 15th following month. †Price f.o.b. trucks at plant, subject to discount of 10c per ton for payment on or before the 15th of following month. ‡F.o.b. plant.

Agricultural Limestone

(Crushed)

Alton, Ill.—100% thru 4 mesh	1.75
Cape Girardeau, Mo.—Analysis, 94½% $CaCO_3$; 3½% $MgCO_3$, pulverized, 90% thru 50 mesh, per ton	1.50
Chico, Tex.—90% thru 100 mesh, per cwt.	1.00
Colton, Calif.—Analysis, 95.97% $CaCO_3$; 1.31% $MgCO_3$ all thru 14 mesh down to powder	3.50
Davenport, Iowa — Analysis, 90-98% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 4 mesh; bulk	1.00
Dolomite, Calif.—Analysis, 54% $CaCO_3$; 45% $MgCO_3$; 99% thru 10 mesh, per ton, 2.10; 49% thru 60 mesh, ¼-in. to dust, per ton	1.70
Gibsonburg, Ohio—Analysis, 55% $CaCO_3$; 43.40% $MgCO_3$; 50% thru 50 mesh, 1.25; pulverized, bulk, 3.00; in bags	4.50
Hillsville, Penn.—Pulverized, in bags, 4.50; bulk	3.00
Knoxville, Tenn.—80% thru 100 mesh, per ton, 2.00*; 50% thru 100 mesh, per ton	*1.50
Lannon, Wis.—50% thru 100 mesh	1.50
Marlbrook, Va.—Precipitated lime; analysis, 97% $CaCO_3$, 50% thru 50 mesh, per ton	2.00
McCook, Ill.—Analysis, 55% $CaCO_3$; 45% $MgCO_3$, 90% thru 50 mesh, 50% thru 50 mesh, 90% thru 4 mesh, 50% thru 4 mesh, all per ton	.60
Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh	4.25
Osborne, Penn.—50% thru 100 mesh, per ton	2.50–4.00
Stone City, Ia.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Waukesha, Wis.—90% thru 100 mesh, 4.10; 50% thru 100 mesh, per ton	2.10

*Bags, 1.00 additional.

Chicken Grits

Chico, Tex.—(Limestone) packed in 100-lb. sacks, per cwt., f.o.b. cars at plant	1.00
Cranberry Creek, N. Y.—Per ton	12.00
Davenport, Iowa—High calcium carbonate limestone, in bags, L.C.L., per ton	6.00
Gibsonburg, Ohio—(Agstone)	10.00
Indianapolis, Ind.—Per cwt.	.54
Los Angeles, Calif.—Marble grits, per ton, incl. sacks	10.00–12.50
Middlebury, Vt.—Per ton (a)	10.00
New York City—Per cu. yd.	1.00
Port Clinton, Ohio—(Gypsum), per ton	6.00
Salt Lake City, Utah—Per ton	.60
Warren, N. H.—(Aggregate)	7.80–11.00
Waukesha, Wis.—(Limestone), per ton	7.00

(a) F.o.b. Middlebury, Vt.

Pulverized Limestone for Coal Operators

Davenport, Ia.—Analysis, 90-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh. 50% thru 200 mesh; sacks, ton	6.00
Joliet, Ill.—Analysis, 48% $CaCO_3$; 42% $MgCO_3$; 90% thru 200 mesh (bags extra)	3.50
Waukesha, Wis.—90% thru 100 mesh	4.10

Mica

Prices given net, f.o.b. plant or shipping point.

Martinsville, Va.—Mine scrap, per ton, 16.00; mica schist, per ton	10.00
Franklin, N. C.	
Clean scrap, washed	20.00
Ground mica, per ton at mill, 20 mesh, 25.00; 40 mesh, 30.00; 60 mesh, 35.00; 100 mesh	50.00
Roofing mica, per ton at mill	25.00
Mine scrap, per ton	20.00
Wet ground mica, 160 mesh, per lb.	.05
Punch, per lb.	.06

Portland Cement

	F.o.b. city named Per Bag	Per Bbl.	High Early Strength
Atlanta, Ga.	.....	†1.87	2.92¶
Birmingham, Ala.	.....	†1.56	2.61¶
Boston, Mass.	.43½	1.74†	2.48¶
Charleston, S. C.	.....	1.89†	2.94¶
Chicago, Ill.	.....	1.05†	2.11¶
Cincinnati, Ohio	.....	1.23†	2.09¶
Cleveland, Ohio	.....	.....	2.34¶
Columbus, Ohio	.....	.....	2.26¶
Dayton, Ohio	.....	.....	2.19¶
Detroit, Mich.	.....	.....	2.30¶
Indianapolis, Ind.	.....	1.39†	2.04¶
Jackson, Miss.	.....	†1.94	2.99¶
Jacksonville, Fla.	.....	†1.96	3.01¶
Kansas City, Mo.	.25½	1.02†	.....
Louisville, Ky.	.....	1.41†	2.09¶
Memphis, Tenn.	.....	†1.73	2.73¶
Milwaukee, Wis.	.....	1.45†	2.20¶
Montreal, Que.	.....	1.66§	.....
New Orleans, La.	.....	1.86†	2.96¶
New York, N. Y.	.37½	1.49†	2.24¶
Oklahoma City, Okla.	.38½	1.54†	.....
Omaha, Neb.	.34	1.36†	.....
Portland, Ore.	.....	2.40	.....
Reno, Nev.	.....	2.76‡	.....
St. Louis, Mo.	.....	1.20†	2.09¶
San Francisco, Calif.	.....	2.04‡	.....
Savannah, Ga.	.....	1.89†	2.94¶
Seattle, Wash.	.....	2.20–2.45	2.80c
Tampa, Fla.	.....	2.00†	3.16¶
Toledo, Ohio	.....	.....	2.28¶
Topeka, Kan.	.30¼	1.21†	.....
Tulsa, Okla.	.36½	1.46†	.....
Mill prices f.o.b. in carload lots, without bags, to contractors.			
Hudson, N. Y.	.....	*1.21–‖1.36	‖2.29¶
Lime & Oswego, Ore.	.....	2.40	.....
Limedale, Ind.	.....	1.50†	.....

NOTE: Unless otherwise noted, prices quoted are net prices, without charge for bags. Add 40c per bbl. for bags. †Includes 10c cash disc. ‡Subject to 2% discount payment 10th of month following invoice date. ¶"Incor" Perfected, prices per bbl. packed in paper sacks, subject to 10c discount 15 days. (c) Quick-hardening "Velo," packed in paper bags. 10c discount 10 days. §Sales tax included at 4%. *Cars mill. ‖Trucks mill.

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Eau Claire, Wis.	.....	.50–1.00
Ohlton, Ohio	1.50	1.50

Glass Sand

(Silica sand is quoted washed, dried and screened)

Klondike, Mo.	2.00
Ohlton, Ohio	2.40
South Vineland, N. J.	1.50

Potash Feldspar

Spruce Pine, N. C.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 11.30%; Na_2O, 2%; SiO_2, 67%; Fe_2O_3, 0.10%; Al_2O_3, 18%; per ton, in bulk 15.00

Topsham, Me.—White; analysis, K_2O, 8.50%; Na_2O, 3.50%; SiO_2, 71.50%; Fe_2O_3, 0.08%; Al_2O_3, 16%, pulverized, 99% thru 200 mesh; per ton in bulk, 17.00; in bags 18.20

Trenton, N. J.—White; analysis, SiO_2, 69%; Na_2O, 3%; K_2O, 9%; Fe_2O_3, 0.08%; Al_2O_3, 18%, pulverized, 99% thru 200 mesh; per ton, in bulk, 19.00; in bags, per ton 20.20

West Paris, Me.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 11.20%; Na_2O, 3.20%; SiO_2, 65.70%; Fe_2O_3, 0.09%; Al_2O_3, 19.20%; per ton, in bulk 19.00

Soda Feldspar

Spruce Pine, N. C.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 5.50%; Na_2O, 5.50%; SiO_2, 68.80%; Fe_2O_3, 0.10%; Al_2O_3, 18.60%; per ton, in bulk 18.00

Masonry Cement

The prices shown here are for various brands of masonry and mortar cement, including cost of bags.

	Per bag	Per bbl.
Cincinnati, Ohio	†.38½	†1.54
Columbus, Ohio	†.40¼	†1.61
Dayton, Ohio	†.39	†1.56
Detroit, Mich.	†.41¾	†1.67
Indianapolis, Ind.	†.37½	†1.50
Louisville, Ky.	†.35½	†1.42
Memphis, Tenn.	†.43½	†1.74
Norfolk, Va.	†.49½	†1.98
St. Louis, Mo.	†.40¾	†1.63
Toledo, Ohio	†.41	†1.64
Winston-Salem, N. C.	†.46½	†1.86

†Packed in paper sacks; price includes cost of sacks, and is subject to 10c bbl. discount for payment in 15 days.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chester, Vt.—Finely ground talc (carloads), Grade A—99-99¼% thru 200 mesh, 8.00–8.50; Grade B, 97-98% thru 200 mesh 7.00– 7.50

1.00 per ton extra for 50-lb. paper bags; 166⅔-lb. burlap bags, 15c each; 200-lb. burlap bags, 18c each. Credit for return of burlap bags. Terms 1%, 10 days.

Emeryville, N. Y.:
- Crude ground talc (200 mesh), bags .. 13.75
- Crude ground talc (325 mesh), bags .. 14.75

Henry, Va.:
- Crude mine run, per ton 3.50– 4.00
- Ground talc (150-200 mesh), in bags– 4.80– 7.25

Joliet, Ill.:
- Ground talc, 200 mesh, in bags:
  - California talc 30.00
  - Southern talc 20.00
  - Illinois talc 10.00

Natural Bridge, N. Y.:
- Ground talc (300-325 mesh), in 50-lb., 100-lb. and 200-lb. bags, per ton 10.00–20.00

Stone-Tile Hollow Brick

Prices are net per thousand, f.o.b. plant.

	No. 4	No. 6	No. 8
Albany, N. Y.*†	40.00	60.00	70.00
Altadena, Calif.	45.00	55.00	65.00
Asheville, N. C.	30.00	40.00	50.00
Atlanta, Ga.	29.00	42.50	53.00
Auburn, Wash.	.....	50.00	65.00
Brownsville, Tex.	.....	53.00	62.50
Brunswick, Me.	29.50	42.25	55.00
Chula Vista, Calif.	32.50	42.50	50.00
Daytona Beach, Fla.	45.00	55.00	65.00
Frostproof, Fla.	45.00	65.00	75.00
Houston, Tex.	36.00	53.00	66.00
Klamath Falls, Ore.	50.00	60.00	70.00
Longview, Wash.‡	.....	50.00	60.00
Los Angeles, Calif.	29.00	39.00	45.00
Macon, Ga.	25.00	35.00	45.00
Mattituck, N. Y.	45.00	55.00	65.00
Medford, Ore.	50.00	55.00	70.00
Memphis, Tenn.	45.00	50.00	60.00
Mineola, N. Y.	40.00	50.00	60.00
Nashville, Tenn.*	32.00	50.00	60.00
New Orleans, La.	45.00	55.00	65.00
Norfolk, Va.	33.00	46.00	60.00
Passaic, N. J.	42.50	55.00	75.00
Pawtucket, R. I.	27.50	41.25	55.00
Presidio, Tex.	55.00	65.00	75.00
Roanoke, Va.	32.50	40.00	50.00
Salem, Mass.	40.00	60.00	75.00
San Antonio, Tex.	37.00	46.00	60.00
San Diego, Calif.	35.00	44.00	52.50
Spartanburg, S. C.	32.50	40.00	52.50

Prices are for standard sizes—No. 4, size 3½x4x12 in.; No. 6, size 3½x6x12 in.; No. 8, size, 3½x8x12 in. *Delivered on job. †10% discount. ‡Stonetile, per 1000 at plant, 4x6x8, 55.00; 4x8x8, 64.00.

Core and Foundry Sands

Silica sand quoted washed, dried, screened unless otherwise stated; lowest net prices per ton f.o.b. plant

City or shipping point	Molding: Fine	Molding: Coarse	Molding: Brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	1.80	1.80	1.80	.....	.....	3.00	.....
Columbus, Ohio	1.50	1.50	.....	.....	.....	3.50	.....
Eau Claire, Wis.	.....	.....	.....	.....	.....	2.00b	.....
Elco, Ill.	Amor. silica, 90-99½% thru 325 mesh, $10.00						
Montoursville, Penn.	.....	.....	.....	1.35a	.....	.....	.....
New Lexington, Ohio	2.00	1.50	.....	.....	.....	.....	.....
Ohlton, Ohio	1.50	1.50	.....	1.50	1.50	1.50	.....

South Vineland, N. J.—Dry washed silica, 2.00 per ton.
(a) To 1.60. (b) To 3.00.

Wholesale Prices of Slate

Lowest prices f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened, 200 mesh, 6.00 per ton in paper bags

Slate Granules

Pen Argyl, Penn.—Color, blue-black, per ton 6.00

Roofing Slate

Prices per square—Standard thickness

City or shipping point	3/16-in.	¼-in.	⅜-in.	½-in.	¾-in.	1-in.
Bangor, Penn.—						
Gen. Bangor No. 1 clear	10.00	20.00	25.00	29.00	40.00	50.00
Gen. Bangor No. 1 ribbon	9.00	16.00	20.00	25.00	35.00	46.00
No. 1 Albion	7.25	16.00	23.00	27.00	37.00	46.00
Gen. Bangor No. 2 ribbon	6.75	.....	.....	.....	.....	.....
Chapman Quarries, Penn.—						
Smooth texture	9.00–11.00	.....	.....	.....	.....	.....
Rugged	8.25– 9.00	a12.50	b18.00	b21.50	d25.00	e30.00

Pen Argyl, Penn.—Albion blue-grey roofing slate, No. 1 clear, 5.50–6.75; mediums, 5.50–6.25; No. 1 ribbon, 5.50–6.25; punching, all sizes, 35c per square.
(a) To 15.00. (b) To 26.50. (d) To 32.00. (e) To 37.00.

Prices are for standard preferred sizes (standard 3/16-in slates), smaller sizes sell for lower prices. Prices other than 3/16-in. thickness include nail holes. Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.

ROCK PRODUCTS solicits volunteers to furnish accurate price quotations.

Lime Products

(Lowest carload prices per ton f.o.b. shipping point unless otherwise noted)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Bulk	Ground burnt lime, Bags	Lump lime In bulk	Lump lime In bbl.
EASTERN:								
Buffalo, N. Y.	6.50	5.50	5.50	11.00	6.00	8.00	6.00	.....
Cedar Hollow, Devault, Rambo and Swedeland, Penn.	.....	8.00c	8.00c	8.00c	7.00	8.00	8.00	.....
Lime Ridge, Penn.	.....	.....	8.00	.....	6.00	7.00	4.50	.....
CENTRAL:								
Cold Springs, Ohio	.....	5.50	5.50	.....	.....	.....	6.00	.....
White Rock, Gibsonburg, Marblehead, Tiffin, Ohio, and Huntington, Ind.	6.50*	5.50	5.50	11.00	6.00	8.00	6.00	.....
Delaware, Ohio	6.50	5.50	5.50	6.50	.....	.....	5.50	.....
Sheboygan, Wis.	.....	10.50	.....	.....	.....	.....	8.50	19.00
Woodville, Ohio	..6.50-9.00x	5.50c	5.50c	9.00	6.00	8.00	6.00	14.00
SOUTHERN:								
Eagle Mountain, Va.	12.00	8.00	8.00	8.00	6.50	8.00	6.50	.....
Keystone, Ala.	13.00	8.00	.....	7.50	.....	.....	5.50‡	13.75
Knoxville, Tenn.	.....	8.00	8.00	7.50	.....	.....	6.50	13.88
WESTERN:								
Kirtland, N. Mex.	.....	.....	.....	.....	.....	.....	.....	12.00d
Little Rock, Ark.	.....	12.40	.....	.....	.....	.....	9.90	17.40
San Francisco, Cal.	(b)20.00	20.00	12.00	20.00	.....	.....	.....	.....
San Francisco, Calif.	§19.00	15.00	12.50	14.00	11.00	13.50†	11.00	19.80‖

(a) In 100-lb. bags. (b) Woodburnt lime: finishing hydrate, 20.00 per ton; pulv. lime, 2.00 per iron drum. Oil-burnt pulv. lime, 13.00–14.50 per ton. (c) In 50-lb. paper. (d) To 15.00. *At White Rock and Gibsonburg, Ohio. ¶In 200-lb. steel barrels. ‖Refund for return of barrels. ‡To 6.50. §To dealers and industrial concerns in carload lots. †To 17.50, plus bags as supplied. (x) In zigzag bags.

Rock Phosphate

Prices given are per ton (2240 lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Fernandina, Fla., B.P.L. 77/76%, per ton	6.50
Mt. Pleasant, Tenn.—B.P.L., 72%, per ton, 5.00; B.P.L., 75%, per ton..	5.75

Ground Rock

(2000 lb.)

Mt. Pleasant, Tenn.—(Lime phosphate) —B.P.L. 75%; per ton, bags extra....	12.80
Ground rock, B.P.L. 72%, per ton....	5.00– 5.50

Florida Phosphate

(Raw Land Pebble)

Mulberry, Fla.—Gross ton, f.o.b. mines	
68/66% B.P.L.	3.15
70% minimum B.P.L.	3.75
72% minimum B.P.L.	4.25
75/74% B.P.L.	5.25
77/76% B.P.L.	6.25

Fullers Earth

Prices per ton in carloads, f.o.b. Florida shipping points. Bags extra and returnable for full credit.

16– 30 mesh	20.00
30– 60 mesh	22.00
60–100 mesh	18.00
100 mesh and finer	9.00
Joliet, Ill.—All passing 100 mesh, f.o.b. Joliet, incl. cost of bags	24.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant.

	Common	Face
Longview, Wash.	15.00	25.00– 60.00
Milwaukee, Wis.	13.00	35.00
Omaha, Neb.	15.00	.....
Prairie du Chien, Wis.	12.00	20.00– 22.50
Wichita, Kan., per 100	*8.00	*8.50

*8x8x16 size.

Cement Building Tile

Lexington, Ky.:	
5x8x12, per 1000	55.00
4x5x12, per 1000	35.00

Wichita, Kan. (Duntile)	Plain	Glazed
8x8x12-in., each	.08	....
6x8x12-in., each	.07	....
6x6x12-in., each	.06	....
4x5x12-in., each	.05	.08
4x4x12-in., each	.04	.07½

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, cream and coral pink	¶12.50–‖14.50	¶12.50–‖14.50
Cardiff, Md. — Crushed green marble (a)	¶12.50–‖14.50	¶12.50–‖14.50
Cranberry Creek, N. Y.	.....	‖12.00
Los Angeles, Calif.—(a)		
White	¶11.00–‖13.50	¶11.00–‖13.50
Snowflake	.....	¶11.00–‖13.50
Golden, browns, grey, blues, blacks	¶16.00–‖18.50	¶16.00 ‖18.50
Dolomite, Calif. (Lone Pine)—(a)		
White	¶8.80– ‖8.80	¶8.80– ‖8.80
Snowflake	.....	¶8.80– ‖8.80
Golden, browns, grey, blues, blacks	¶13.80–‖13.80	¶13.80–‖13.80
Middlebrook, Mo.—Red	.....	20.00– 25.00
Middlebury, Vt.—White	.....	¶9.00–‖10.00
Randville, Mich.—Crystalite, crushed white marble, bulk	4.50	4.50– 5.00
Tuckahoe, N. Y. (b)	5.00– 6.00	.....
Warren, N. H.	.....	¶5.80–11.00

¶C.L. ‖L.C.L. *Per 100-lb. (a) Including bags. (b) 5.00 per ton on 5-ton orders; less than 5 tons, 6.00 per ton.

Art and Cast Stone Aggregates

Cardiff, Md.—Green marble fines in carloads; bulk, 7.50; in bags	10.00
Los Angeles, Calif.—Dolomite aggregates, all sizes and colors†	¶10.00 ‖12.50
Dolomite special cast stone, wet-cast aggregate, white, ¼-in. to dust a	5.30

† 100-lb. sacks. ¶C.L. ‖L.C.L. (a) In open cars.

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

Camden, N. J.: 8x8x16, each	.17a
Lexington, Ky.:	
8x8x16	‡18.00*
8x8x16	†16.00*
Omaha, Neb. (Prices f.o.b. plant)	
8x8x16, each	.10
Wichita, Kan.:	
4x8x16, each	.07

*Price per 100 at plant. †Rock or panel face. ‡Face. (a) Less 10%.

Cement Drain Tile

Longview, Wash.—Price per foot.

3-in.	.05	6-in.	.10
4-in.	.06	8-in.	.15

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Cicero, Ill.—French and Spanish tile, 9x15-in., per sq.	9.50–12.00
Closed end shingle, 8½x12½ in., per sq.	11.00–13.00
New York City, N. Y.—Red, per sq., 10.00; green, per sq.	12.00

Study Possibilities of Five Minerals in North Carolina

PROSPECTIVE developers of mineral property in North Carolina at present are focusing their attention on five minerals, H. J. Bryson, state geologist, said upon his return from a field trip to mineral centers of the state.

Of the five only one, kaolin clay, is now being produced in commercial quantity in the state. Two others, chromite and beryl, have been produced commercially in Tar Heelia in past years but kyanite and clivene or dunite have never been.

Developers appear pleased with efforts to locate deposits of kaolin to replace English clay. Several companies are reported to have tested kaolin from newly located deposits in the state and seem satisfied they will meet the requirements, Mr. Bryson said, and in fact some of the new clays are superior to English clay.—*Goldsboro* (N. C.) *Argus.*

Phosphate Exports Decline and Cement Exports Increase from Tampa

EXPORTS of phosphate from the Port of Tampa, Fla., showed declines for October as compared with September, but lumber exports increased over a million feet, and exports of cement increased nearly 2000 bbl., it was stated recently.—*Jacksonville* (Fla.) *Times-Union.*

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4-in.	6-in.	8-in.	10-in.	12-in.	15-in.	18-in.	20-in.	22-in.	24-in.	27-in.	30-in.	36-in.	42-in.	48-in.	54-in.	60-in.
Grand Rapids and Saginaw, Mich.																	
Culvert (d)	.....	.....	.....	.55	.60	1.00	1.35	1.60f	.....	1.80	2.00	2.25	3.10	4.00	5.10	6.00	7.45
Sewer (c)	.....	.12	.18½	.27½	.35	.47	.82½	.99e	1.32	1.48½	.....	.....	.....	.....	.....	.....	.....
Longview, Wash.																	
Culvert	.....	.30	.40	.....	.55	.....	1.10	.....	.....	1.50	.....	2.70	4.25	5.00	.....	.....	.....
Newark, N. J.																	
Unreinforced	.08	.16	.26	.36	.46	.56	.90	1.10	1.26	1.50	.....	.....	.....	.....	.....	.....	.....
Reinforced	.....	.....	.....	.....	.90	1.05	1.40	1.60	1.75	2.05	2.60	3.00	4.00	5.00	6.00	8.50	12.00
Wahoo, Neb.	12-in., 15-in., 18-in., 24-in., and from 30-in. to 60-in. pipe, per ton, 10.00																

(a) Reinforced. (c) To dealers. (d) To contractors. (e) 21-in. pipe, 1.11. (f) 21-in. pipe.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

City or shipping point	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¼x32x 36". Per M Sq. Ft.	⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
East St. Louis, Ill.—Special Gypsum Products—Partition section, 4 in. thick, 12 in. wide, and up to 10 ft. 3 in. long, 12c per ft., 21.00 per ton; outside wall section and interior bearing wall section, 6 in. wide, 6 in. thick, and up to 10 ft. 3 in. long, 25c per ft., 30.00 per ton; floor section, 7 in. thick, 16 in. wide, and up to 13 ft. 6 in. long, 17c per ft., 23.00 per ton.													
Los Angeles, Calif.	.....	.....	7.90p	.....	12.20	.....	13.20	.....	.....	.....	.....	.....	.....
Medicine Lodge, Kan.	1.45	.....	.....	.....	.....	.....	11.50b	.....	16.00b	.....	.....	.....	.....
Port Clinton, Ohio	4.00	6.00–8.00	6.00–8.00	10.00m	10.00n	10.00n	20.00k	8.00–11.00	24.50f	26.00g	15.00h	15.00h	27.00j
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	.....	.....	.....	.....	20.00	25.00c	33.00d
Woodville, Ohio	.....	.....	.....	.....	.....	.....	.....	.....	25.50b	.....	.....	.....	.....

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable). (a) Plasterboard, ⅛x32x36 in. (b) Includes paper bags. (c) Includes jute sacks. (d) "Gyproc," ⅜x48-in. by 5 and 10 ft. long. (f) To 27.50. (g) To 29.00. (h) To 16.00. (j) To 28.00. (k) To 23.00. (m) To 12.00. (n) To 13.00. (p) To 8.90.

Uses Rock Products' "Open Letter"

OF INTEREST is a recent activity of the Beaver Portland Cement Co., Portland, Ore. To center the attention of the building industry in its territory on the problem of public construction the following letter was mailed to its dealers and to the architects, engineers and contractors in Oregon:

"We commend to your most thoughtful consideration the inclosed copy of an open letter in Rock Products for September 26, 1931.

"Mr. Aronoff, director of the public works section of the President's Emergency Committee for Employment, estimates that plans for $2,000,000,000 worth of public work are so far advanced that they could be immediately translated into labor-using activity and that another $4,000,000,000 are in the offing.

"Six billion dollars spent on public construction will go far, very far to relieve present distress and to rectify the evils of depression. If the execution of this work is being held up or delayed through governmental red tape, national, state or municipal, the red tape should be promptly cut. If local bickerings impede progress, as in the case of Portland's Public Market, then those bickerings should be suppressed.

"It will take constant pressure on our public officials responsible for this state of affairs to get the construction program under way. Let's resolve to exert this pressure unceasingly on public officials in city, county, state and nation; not confining our efforts to generalities but making them concrete by demanding that work be started at once on all projects which are ready, and that plans for the balance be properly expedited."

This letter was signed by Buell C. Nelson, assistant secretary, and in addition to a copy of the open letter from Rock Products a list entitled "Something Tangible to Shoot At" named specific local projects upon which effort might be centered.

This is certainly an excellent example of being specific in promotional activities and should result in direct benefits.

To Sell Large Limestone Deposits in California Soon

WITH THE FILING for record in the office of the recorder of 18 placer mining locations, there has been disclosed in the eastern part of Riverside county, Calif., one of the most extensive and valuable deposits of high grade limestone in the United States.

This limestone occurrence has been apparent to all travelers in the vicinity of the Little Marie mountains and was believed by most observers to be of the magnesium-calcium variety known as dolomite.

Not until the discoverer of its unusual purity had his own tests confirmed by chemists, did the potential value of his find become apparent. A composite sample, taken at widely separated portions of the deposit, when analyzed, showed, as indicated by the assay certificate, a content of 99.45% of calcium carbonate and .23% magnesium carbonate.

There is said to be available not less than 100,000,000 tons of this material on more than 2000 acres embraced by the locations placed on file.

The deposit is convenient to transportation on the Blythe branch of the Santa Fe railroad.

There is also located on the property a large deposit of white and variegated marble of exceptionally fine quality.

The Pacific Coast Exploration Co. of Riverside is part owner of the property and expects to develop and place it on the market in the near future.—*Riverside* (Calif.) *Press.*

New Company Takes Over Frank J. Boland, Inc., and Will Increase Activities

NEWS OF THE INCORPORATION of a new company, to be known as the Binghamton Crushed Stone and Gravel Corp., to succeed Frank J. Boland, Inc., marks a milestone in the development of one of the larger Binghamton, N. Y., industries and is of interest to those engaged in the building and contracting business.

Along with this comes the additional news that Frank J. Boland, for 20 years the president and active head of Frank J. Boland, Inc., is retiring from active duty with the corporation, although still retaining a large interest in the company. He announces that he will devote his time to his real estate interests in Broome county.

Most of the stock in the new corporation is to be held by Binghamton and Johnson City business men, who will retain control of it, although a large block has been purchased by Utica interests. There will be some changes in the officers of the company and in the office personnel, although these have not yet been announced. The sales force will be increased, with the addition of several more men.

A large expansion within the next few years is indicated for the corporation, which owns several hundred acres of sand and gravel deposits in this vicinity, mostly along the Chenango river.

The new company will specialize in washed sand and gravel and several grades of crushed stone, a total of 14 kinds of material. All of this material has already been approved by state authorities for use in road construction and other state and municipal contracts.

The capacity of the various plants will be 4000 yd. per day.—*Binghamton* (N. Y.) *Sun.*

Quarries on Isle of Portland Still Important Producers

AN ARTICLE describing quarrying operations at the Isle of Portland and projects in which Portland stone have been used was recently published in the (British) *Stone Trades Journal.* This is the stone for which portland cement was named, because of the similarity of color.

The article says these quarries have provided material for many of the finest edifices in England. Large quantities have also been used for monumental work. Stone from these quarries has also been shipped to many foreign countries for use in important engineering and construction projects.

To mention a few buildings which have been erected of Portland stone, and which are particularly in the public eye, of course St. Paul's cathedral stands pre-eminent, as well as numerous other churches in London which were built by Sir Christopher Wren after the great fire of London. The Banqueting House in Whitehall, now used as a museum by the United Services, is reputed to be the oldest existing building in which Portland stone was employed, and this was designed by Inigo Jones, who was surveyor-general of royal buildings from 1612, in the reign of James I, and continued office until the execution of Charles I.

Several companies produce stone in these quarries but it is estimated that two firms, Bath and Portland Stone Firms, Ltd., and Messrs. F. J. Barnes, Ltd., produce 90% of the annual output of the Isle, which approximates 100,000 tons.

The marketable stone is reached at an average depth of some 30 ft. The top bed is known as whitbed and the lower one as basebed. The latter is a beautiful white limestone of close texture. Although enormous quantities of stone have been removed in the past there seems to be an ample supply still available.

There is no limitation on labor for stripping operations but the actual quarrying of the stone is still reserved to local men born of Portland parents.

English Company Builds New Cement Plant and Enlarges Lime Plant

CEMENT INDUSTRIES, LTD., has awarded contract for construction of a complete portland cement plant at Asheham, near Lewes, England.

The plant is designed for an ultimate capacity of 5,000,000 bbl. per year. It will consist of three units, the first of which is being installed.

The plant will operate on the thick slurry system, it is reported. It will concentrate on the production of rapid hardening cement.

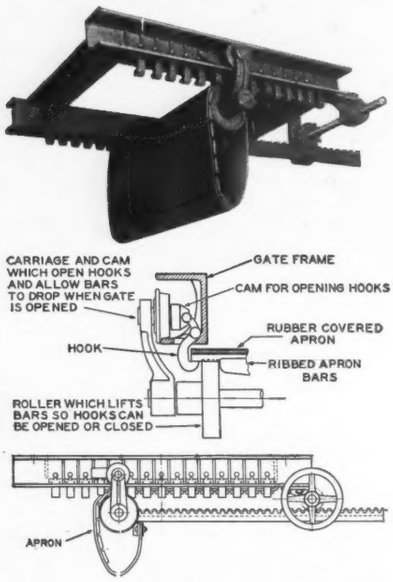
In addition to the new cement plant the *Stone Trades Journal* reports a Schulthess lime hydrating plant is being installed in connection with the existing lime plant.

New Machinery and Equipment

Apron Gate

IN THE "APRON GATE," recently developed by Stephens-Adamson Manufacturing Co., of Aurora, Ill., for horizontal bin bottoms, sliding friction has been eliminated and the largest size gate can be opened by one man, the manufacturer states.

As shown in the illustration, this apron


CARRIAGE AND CAM WHICH OPEN HOOKS AND ALLOW BARS TO DROP WHEN GATE IS OPENED
GATE FRAME
CAM FOR OPENING HOOKS
RUBBER COVERED APRON
HOOK
RIBBED APRON BARS
ROLLER WHICH LIFTS BARS SO HOOKS CAN BE OPENED OR CLOSED
APRON

Above—Apron gate partially open. Below—Details of mechanism

gate operates on a principle in which the gate opening is closed by a series of reinforced cross bars covered with a wear-resisting rubber apron, which is said to prevent spillage and the leakage of drain water between the bars. In operation the bars are lifted *one by one,* unhooked and lowered from beneath the material above the gate opening.

A rack and pinion, driven by hand or chain wheel, moves an operating carriage back and forward to open and close the gate. In opening, the carriage is pulled backward causing the two lower rollers to lift the apron bars slightly and disengage the hooks. The cams shown hold the hooks out until the rollers have passed and the apron has dropped.

In closing, the carriage is pushed forward, the cams open the hooks, the rollers lift the bars into place, the hooks engage and the apron bars support the load in the bin above.

Features of this equipment, the manufacturer states, are easy operation, no sliding friction, simplicity, durability, light weight, little headroom required, low first cost and suitable for large openings with a reduced tendency for material to bridge over the opening.

•

Constant Weight Feeder

A NEW TYPE of constant weight feeder is announced by the Hardinge Co., York, Penn. The manufacturer states this feeder was designed to operate over long periods of time, under extremely severe conditions, with but nominal attention.

Its construction is similar to that of a heavy duty conveyor. A new method of take-up is incorporated in this feeder, which is shown in the illustration. The belt is tightened at the end of the supporting channel, and this arrangement permits considerably more take-up.

The feeder is equipped with ball or roller bearings at fulcrum points and all pivot points.

Capacities range from 7 tons to 650 tons per hour, depending upon the belt speed.

Submersible Floodlight

A NEW FLOODLIGHT, designated as Type AL-33B, has been introduced by the General Electric Co., Schenectady, N. Y., for under-water applications. Superseding the Type L-33 unit, the new projector is said to have a more efficient optical system, permits a wide variety of mountings, and can be inserted or withdrawn from special niches by means of brackets for servicing. Lamps of 400 watts can be used, although the standard 250-watt floodlight lamp is the recommended one. The projectors are of cast aluminum.

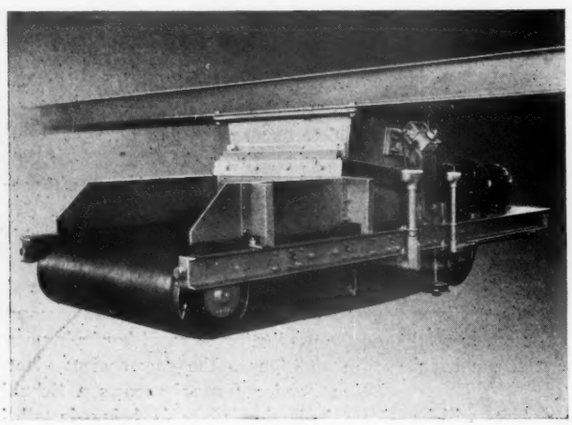
•

Announces Convertible Shovel

THE Austin Manufacturing Co., Chicago, Ill., has developed an 11 cu. ft. shovel that is convertible to a clamshell, dragline or crane.

According to the manufacturer, cut gearing enclosed and running in oil, with ball or roller bearings, all fully enclosed and sealed, is used at every moving point of consequence. The whole main frame assembly is reinforced and electrically welded. The mast supporting structure, the dipper and other parts, are similarly fabricated and designed to reduce weight and increase strength, it is said.

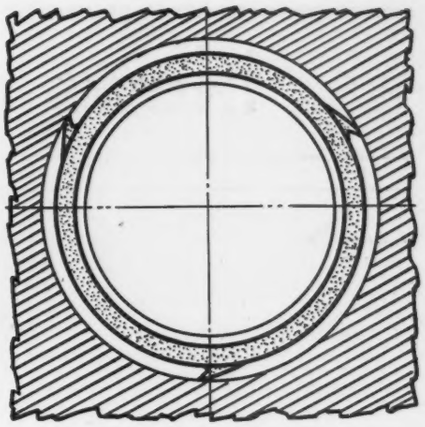
The Austin "Badger" has a full three-quarter swing, while the crawlers are so geared and controlled independently that the shovel can turn in its own length and be quickly placed in a favorable operating position, it is claimed. The crawlers are a full 10 ft. 6 in. in length and measure 7 ft. 8 in. from outside to outside in width. A specially constructed boom, which the manufacturer states is of improved design and better balance, gives the bucket high lifting.



Belt is tightened at end of supporting channels

Special boom to increase bucket lift

Combines tractor and road roller in one unit



Projections center gasket in fittings

Powered with a McCormick-Deering model 20 "Industrial" unit, with a transmission having a number of speeds forward and one reverse, the Austin "Badger" can travel as fast as 4 miles per hour. When traveling any considerable distance, however, a heavy rubber-tired portable truck arrangement is used.

In addition to the foregoing, booster type clutches, renewable brakes, and high pressure lubrication are combined with easy accessibility to all parts.

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Innovation in Tractor Equipment

THE HERCULES "Crawl Tractor," just announced by the Hercules Co., Marion, Ohio, brings the field of usefulness of the tractor and road roller into the capacity of one machine.

The manufacturer states this new machine was developed to meet the requirements of heavy duty tractor users and to fill the need of heavy construction and road contractors for a machine that would reduce the capital investment required for two separate pieces of equipment and supply one unit with the full utility of two.

The Hercules "crawl tractor" is said to be capable of safely working on extremely rough and broken ground.

According to the manufacturer, it crosses ditches or passes over steep hills without pitching and removes all danger of overturning or "nose diving."

The Hercules "crawl tractor" is a standard model 60, 80 or 100 Hercules chassis mounted on two crawler trucks mounted in ball and roller bearings. To convert this tractor into a roller it is only necessary to jack up the rear end, take off the crawler trucks, and replace the roller wheels.

The model 60 is said to develop a drawbar pull of 8000 to 10,000 lb. The drawbar pull of models 80 and 100 is proportionately greater.

All models have three speeds forward and backward, controlled by a single operating lever.

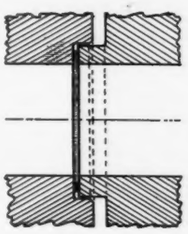
All models of these tractors are powered by a standard six cylinder engine.

Uses to which this tractor may be applied include hauling earth or rock, handling bulldozer, drawing, plows, drag scrapers, hauling large diameter pipe and heavy timber.

●

Metal Gasket

A NEW METAL GASKET has recently been announced by the Babcock and Wilcox Co., New York, N. Y., primarily for use in making connections between the ends of economizer tubes and the return bend fittings.



Gasket in proper position

The gasket is made with a series of projections on the outside, arranged so that they may be bent by hand, so as to center the gasket and hold it in place while assembling the parts. The projections are thinner than the gasket proper so when the gasket is compressed enough to make a satisfactory joint the seats will not compress the projections, and the gasket material is allowed to spread without being hindered in any way by the centering devices, the manufacturer states.

●

Enclosed Model Shovel

THE Michigan Power Shovel Co., Benton Harbor, Mich., has announced an enclosed model shovel with complete enclosure for the operator.

One of the features claimed for this new model shovel is clear vision for the operator at all times. The cab is designed so that sides and front can be removed if desired and, the manufacturer states, the interior is of sufficient size to permit complete servicing of turn table mechanism without removing the sides of the cab.

According to the manufacturer, the "Michigan" shovel is the first shovel to be manufactured having the features of full circle loading with no tail swing and enclosure for the operator.

Sides and front of cab can be removed

News of All the Industry

Incorporations

Gold Mines, Inc., Belleville, N. J., $300,000. To operate mines and quarries.

Lloyd Noble, Inc., Wilmington, Del., $25,000. To produce minerals.

Lilley Mining Co., Wilmington, Del., $25,000. To produce minerals.

Camden Gravel Co., Inc., Camden, Ark., increased capital stock from $25,000 to $32,000.

Pine Mountain Stone Co., Whitesburg, Ky., $15,000. L. M. Hart, J. D. Hart and W. M. Hart.

M. M. Thomas Flint Rock Corp., Ocala, Fla., 100 shares, par value $100 each. M. M. Thomas, C. C. Williams and C. C. Lory, directors.

Manning and Locklin Northville Co., Northville, Mich., 5205 shares of no par value. To produce sand and gravel, etc.

Commonwealth Sand and Gravel Corp., Norfolk, Va., increased capital for enlarging purposes. John Twohy II, president.

Coan Bros. Co., Lawrence, Mass., 200 shares of no par value. Joseph A. Coan, Myrtle B. Coan, Lawrence, Mass., and Meyer Banquer, Boston, Mass. To produce cement.

Columbia Marble Co., Marble, N. C., $200,000. To quarry granite, marble and minerals. C. Gomolli, Elberton, Ga., and T. R. Coggins, Jr., Marble, N. C.

Chicago Waylite Aggregate Co., 139 N. Vermilion St., Danville, Ill., $30,000 preferred stock and 600 shares of no par value. H. A. Adams, W. M. Acton and D. S. Baldwin.

Columbia Cement Co., Portland, Ore., $1000. E. L. Wilson, 1141¼ Grand Ave., Portland, N. D. Hill and Genevieve Hahn, also of Portland. To produce concrete brick.

Farmers' Phosphate Supply Co., Mt. Pleasant, Tenn., $3000. Frank S. Wheeler, C. A. Brownlow, Jr., Alden H. Smith, Harry Hill and D. W. Cecil, all of Mt. Pleasant.

MacArthur Concrete Pile Corp. (New York corporation), incorporated with principal office, Richmond, Va., 1650 shares of no par value. Wm. W. Crump, agent in charge of business.

Quarries

Olympic Stone Co., Ballard, Wash., had its plant destroyed in a fire there recently.

Independence, Kan. The county rock crusher which has been operating near Wayside has been shut down temporarily for repairs.

Vancouver, Wash. Bert Lathrop, superintendent in charge of opening the quarry at Fishers Station, reports that excellent progress is being made in the work.

Federal Crushed Stone Co., Jasper, Minn., has distributed 40% dividend checks to stockholders, and at a previous date a 50% dividend was paid. This ends the receivership of the company.

Fayetteville, Tenn. County Agent Barrett has announced that a state lime crusher for farmers of the county will be here soon. Farmers are to pay 60c a ton and will be limited to 60 tons each.

Raymond, Ia. William Weiden, Raymond blacksmith, who has constructed an agricultural limestone crusher, gave a demonstration of the machine near Littleton recently.

St. Charles Lime and Quarry Co., St. Charles, Mo., has filed a report on its receivership. The receiver has also filed application for permission to sue Woods Brothers Construction Co. for $2600.

Standard Lime and Stone Co., Millville, W. Va., has installed an electric shovel in its quarries to take the place of a steam shovel which has been used there for 10 years or more.

Detroit Standard Stone Co., new owner of the old stone quarry about 13 miles from Portland, Mich., plans to erect a power house at once. J. E. Montone will be in charge of production of the sand stone.

Carroll, Ia. It is said engineers have been examining the old stone quarry at Macedonia to see if it could be operated profitably in providing crushed rock for state highway 4. This quarry has been abandoned for many years.

Cape Cod Sand and Cement Co. and the building material division of Borden and Remington Co., New Bedford, Mass., have combined to form Building Materials, Inc., and will handle retail building materials there.

James Baines and Dr. A. N. Thompson, Sonoma, Calif., started removing stone from their quarry in the Boyes Springs Park property recently. They hope to develop a market of good proportions in the near future.

Sequoyah Marble Co. has been organized to take over the old marble quarry near Marble City, Okla. W. K. Palmer, Kansas City, Mo., is the consulting engineer and managing director. He is making arrangements for reequipping the quarry and building a finishing mill.

Marshall, Mo. The quarry which has been operated by the government near Arrow Rock since late in 1928 has been closed down. A small part of the quarry equipment has been moved to another government quarry a few miles up the river and the balance of the serviceable equipment was shipped to Gasconade, Mo., for storage.

Marble Cliff Quarries Co., Columbus, Ohio, and its quarrying operations along the Scioto river were graphically described on a full page of the rotogravure section of the *Columbus State Journal* November 1. Hand quarrying operations started at this location in 1850 or earlier, the article stated. Excavation and reduction of 50,000,000 tons of limestone have been made from this operation.

Cement

Portland Cement Co. of Utah, Salt Lake City, Utah, has reopened its plant and quarry, which have been closed since July. "One hundred men are going back on a full-time basis and at their former wages," said Ashby Snow, president of the company, in announcing resumption of work by the company.

Aetna Portland Cement Co., Bay City, Mich., is planning to establish additional warehouse facilities on Lake Michigan which could be supplied by water-borne shipments from Essexville. Officials of the company have said "that this is expected to pave the way for expansion of the Essexville project, on which more than ¼ million dollars has been spent in the last 18 months."

Lime

Missouri Lime and Mining Co. has leased space in the Exchange building at Kansas City, Mo., and is moving its offices there. For many years it has been located in the Commerce building.

Kimbalton Lime Co. Inc., Shawsville, Va., has shared a group insurance policy with its employes. Each worker receives insurance in amounts ranging from $1000 to $25,000, according to rank, the employes sharing with the Kimbalton company in the paying of premiums.

A. W. Ainsworth, Big Springs, Tex., will erect a modern lime kiln there. Limestone testing 97% has been found in the mountains near Big Springs. Joe B. Neel has asked permission to mine on 320 acres of land containing this limestone. Arkansas interests are also interested in this venture. It is reported that nearly 200 men will be put to work on this project.

Sand and Gravel

Knoxville Sangravl Material Co., Knoxville, Tenn., was recently cleared of a charge that its dredge had damaged fish nets near its operation.

Pioneer Sand and Gravel Co., Seattle, Wash., will construct a $5000 bulkhead in Lake Union to provide additional plant facilities.

Columbia Sand and Gravel Co., Middletown, Ohio, has had M. Luther Robinson appointed receiver.

Shawnee county, Kan., has completed survey of the bank lines of the Kaw river, which according to Kaw law makes it eligible to participate in sand royalties paid the state.

Builders Sand and Gravel Co., Davenport, Ia., has sent representatives to Washington to effect a settlement for river front right-of-way necessary for the government dam.

Ideal Sand and Gravel Co., Mason City, Ia., was recently described in a news story in the *Mason City Gazette.* A description of its plant and operation was given.

Oxford, Mich. To keep operating costs at a minimum, work at the local gravel pits has been carried on at night because of the lower power rate.

Tennessee-Arkansas Gravel Co., Arkansas City, Ark., will soon construct a pumping plant for a bank pit in Mississippi, using Diesel power and motors.

Portsmouth Sand and Gravel Co., Portsmouth, Ohio, recently obtained a publicity story in the *Portsmouth Times* based on the need of clean aggregate to produce good concrete. Its facilities for providing such aggregate were told.

Louis K. Porter is reported to have the only deposit of fine commercial sand in Klamouth county, Ore., which was found recently near the Williamson river. The vein is 70 ft. high and is said to contain millions of yards of sand.

Personals

E. K. Brunsdale, treasurer of the Pioneer Gravel Equipment Co., Minneapolis, Minn., has been in the Pacific Northwest investigating business conditions.

Jacob Sechler Coxey, president and treasurer of the Coxey Silica Sand Co., was recently elected mayor of Massillon, Ohio. An army of unemployed were led to the national capital to obtain relief by Mr. Coxey 37 years ago.

L. O. Mueller, general manager of the Stotzer Granite Co., Portage, Wis., has resigned from active participation in the management of the company and Fred W. Luethge will succeed him as sales manager.

Gideon L. Austin, manager of the Parsee Cement Co., Bombay, India, sailed October 20 for the United States. Mr. Austin has been employed by the Parsee company for eight years and is now making an investigation of the advisability of burning oil instead of coal in the production of cement.

A. W. Catlin, well known in the cement industry, is now representing the Manitowoc Shipbuilding Corp., the Manitowoc Engineering Works and the Dixie Machinery Manufacturing Co. in the middle west. Mr. Catlin has established offices in the Builders Bldg., Chicago, Ill.

Ralph T. Miller, formerly with the Hermitage Portland Cement Co., Nashville, Tenn., and more recently vice-president and general manager of the Cumberland Portland Cement Co., Cowan, Tenn., is now associated with the New York sales office of George and Sherrard Paper Co., 220 E. 42nd St., New York, N. Y.

Obituaries

Charles E. Carter, 65, millman at the Oregon Portland Cement Co., died recently after a short illness.

Charles A. Patterson, 66, secretary of the Wood County Stone and Construction Co., died in his home in Bowling Green, Ohio, November 10.

J. Foster Cook, 39, sales manager for the Cumberland Portland Cement Co., Nashville, Tenn., was found dead in his office October 31.

Atherton Loring, director of the Massachusetts Lime and Cement Co., died in Boston November 1. He was also interested in a number of other organizations.

Mrs. Ella Chamberlain Day, widow of Chapin A. Day, president of the Utah-Idaho Portland Cement Co., who passed away in October, died in Los Angeles, October 31, from pneumonia contracted while attending the funeral services of her husband.

James D. Houston, 52, foreman of the Utah Granite and Marble Co., was crushed to death by a five-ton granite slab which fell on him at the company quarry November 8. Mr. Houston had been an employe of the company for 33 years.

Lewis T. Robinson, 63, engineer in charge of the general engineering laboratory of the General Electric Co., died from a heart attack at his home in Schenectady, N. Y. Mr. Robinson started his engineering career as an office boy for Professor Elihu Thompson of the old Thomson-Houston Electric Co. at Lynn, Mass. This association with Professor Thompson developed his interest in scientific matters. Mr. Robinson had been connected with the General Electric Co. since February 3, 1896, when he was placed in charge of the standardizing laboratory, which position he held until 1919, when he was made engineer in charge of the general engineering laboratory. He has received much recognition for his work in the electrical field.

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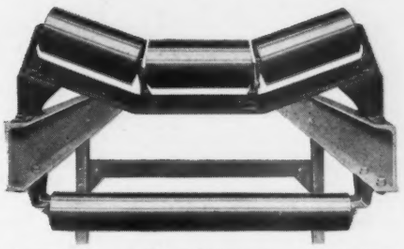
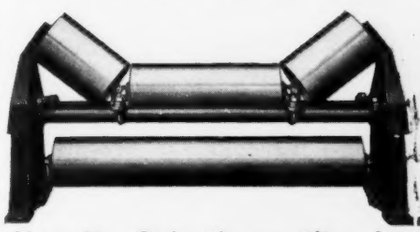
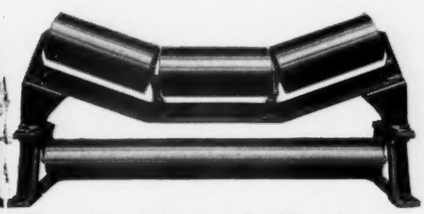


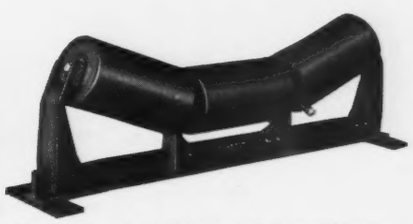
Type 40—For general use. Features are Timken Bearings, grease seals which protect bearings from dirt, and machined rolls. The standard of anti-friction idler construction.



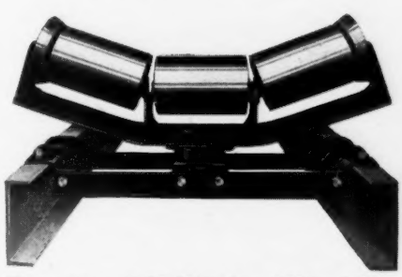
Type 48—Grain Elevator Idler, designed to meet the general dimension requirements of grain elevator service. Widely used to replace plain-bearing idlers as they wear out.



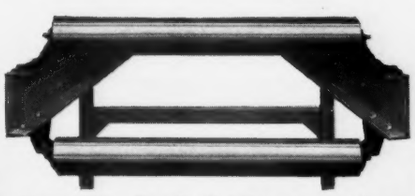
Type 42—Unit Stand Idler, for use where it is desired to have the entire conveyor above the floor or other supporting structure. Bearings and grease seals are the same as in Type 40.



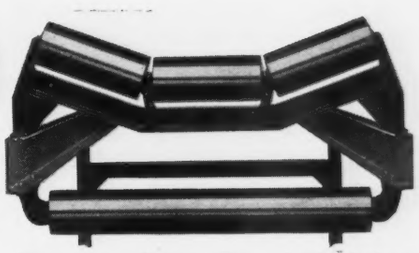
Type 70—Anti-Friction Idler, Timken-Bearing equipped. For conveyor belts 14" to 48" wide.



Type 57—Self-Aligning Idler. This type maintains the training of the belt under unusual operating conditions, and materially lengthens life of belt. Used at relatively long intervals, between fixed idlers on belt conveyor run.

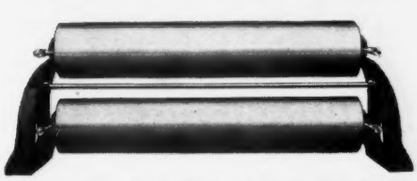


Type 44—Flat Roll Idler, for package conveyors, distributing conveyors, etc. Roll construction is same as that of the Link-Belt Anti-Friction Return Idler.

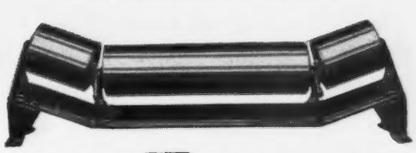


Type 49—Heavy Duty Anti-Friction Timken-Bearing type, used by mining industry, cement mills, rock crushing plants, or wherever large tonnages or heavy materials are handled.

Type 58—A Flat Roll Idler built for heavy duty service in foundries, machine shops, etc. Bearings and grease seals are the same as in Type 40. Requires minimum of maintenance.



Type 63—Flat Roll, Unit Stand, Ball Bearing Idler, at lower cost than Timken-equipped idlers. Gives dependable service. This type is suitable for narrower width flat belts.



Type 43—Picking Table Idler. Widely used in coal or ore mining industries.

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